NPS ARCHIVE
1965
DAVIS, R.

MANAGEMENT FOR MAINTENANCE, MATERIAL AND OPERATIONAL READINESS

by
Lcdr. R.O. Davis

Thesis
D174

Library
U.S. Naval Postgraduate School
Monterey, California

DUDLEY KNOX LIBRARY
NAVAL POSTGRADUATE SCHOOL
MONTEREY CA 93943-5101

MANAGEMENT FOR MAINTENANCE, MATERIAL AND OPERATIONAL READINESS

By

Ralph Oliver Davis

Bachelor of Science

Hendrix College, 1948

A Thesis Submitted to the School of Government, Business and International Affairs of The George Washington University in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

April 26, 1965

Thesis directed by

Karl E. Stromsem, Ph. D.

Professor of Public Administration

NPS Archive
Slot
Davis, R.

PREFACE

A General Line Officer is always faced with what he feels are mountains of useless paperwork. Aboard ship, the usual operations must go on while underway and reams of paper are used in making up reports for one purpose or another. At Navy Headquarters, Washington, D.C., various rumors have circulated regarding systems of management to reduce the heavy paper workload of the operating unit.

This paper is based on a study of the primary program for management efficiency that will soon be used fleet wide in the United States Navy. It is the Navy Maintenance and Material Management System, a combination of three different programs intended to produce the desired efficiency and feedback required in the complex mechanical and electronic scope of today's military operations.

Information on the readiness of a particular unit for combat operation, show of force, or just inter-type exercises is needed by top planners to provide the forces necessary in carrying out a given task or mission. At present these reports of readiness are numerous and more often than not duplicates. In this paper, the author has looked into a program, now in the formative stage, which will provide the necessary readiness information of a particular unit or fleet in a complete up-to-date report from a single source. This Single Readiness Reporting System

is in the formulative stage and time will tell if it is a success or failure.

The effort of this paper is to investigate the programs in detail and not to judge or make decisions as to their merit. Several questions that have arisen are entered at the end of Chapter Six.

R. O. Davis

TABLE OF CONTENTS

		Page
PREFACE		iii
LIST OF ILLUSTRATIONS		vi
Chapter		
I	NATURE OF THE PROBLEM	1
II	MAINTENANCE AND MATERIAL MANAGEMENT	9
III	PLANNED MAINTENANCE SYSTEM	22
IV	DATA COLLECTION SYSTEM - SHIPBOARD	30
V	READINESS REPORTING	48
VI	PROGRAM PROGRESS	58
APPENDICES		66
BIBLIOGRAPHY		96

LIST OF ILLUSTRATIONS

Figure		Page
1	ADP Installation Schedule	18
2	Installations Schedule	21
3	Completed Maintenance Requirement Card	24
4	Sample Index Page of Planned Maintenance System Manual . .	27
5	3-M Information Flow	33
6	OPNAV Form 4700-2B	35
7	Functional Flow Diagram for 4700-2B	36
8	OPNAV Form 4700-2D	37
9	Functional Flow Diagram for 4700-2D	38
10	OPNAV Form 4700-2C Copy #1	42
11	OPNAV Form 4700-2C Copy #2	43
12	OPNAV Form 4700-2C Copy #3	44
13	OPNAV Form 4700-2C Copy #4	45
14	Functional Flow Diagram for 4700-2C	46
15	Maintenance Performance	60

CHAPTER I

NATURE OF THE PROBLEM

Man has tried to determine his efficiency by some system of measurement since the beginning of time. Often he has had to invent or create a system of measurement that would give the information needed to determine his success or failure. Particularly in today's modern society, this problem exists. The military services have unique problems in this area since conventional measurement techniques do not determine conditions of readiness, or efficiency of manpower utilization.

At the end of a business year, a businessman can close his books and determine, by the amount of dollar profit or loss, whether his business is in good condition and just how efficiently it was operated. In contrast, the commanding officer of a combatant ship awaits the beginning of the fiscal year so that his ship can get its share of the annual military budget for the operations of his ship. He has no measure in dollars to determine the efficiency or the operating conditions of the ship. What, then, does the commanding officer use to measure the conditions of his ship?

A businessman plans, budgets and forecasts the conditions of the next year to make his business a profit. His measurable success is the profits resulting from his management. There may also be some side

rewards to his business: such as, furnishing the community with a badly needed service, bringing in new products for the well being or economic need of the community, or by measuring his success in terms of the number of men he employs. These measures apply to his self-satisfaction only and cannot be documented for the outside world to judge, as are the profits he has generated.

The commanding officer of a ship does not have the profit measure to gauge the standards of his ship with those of other ships. He, therefore, must find another way to show his ship's "growth" and capabilities.

The problem of establishing a measure of competence and efficiency has been with the Navy for years. There have been many individual approaches, but none has really resulted in a simple tool for use as a measure for a ship.

In the days when the Navy consisted almost completely of manual labor and leadership there were not the problems that exist today. The commanding officer provided leadership, and manual labor was easy to acquire. Today the commanding officer cannot possibly have the knowledge to attack all the technological problems that occur on a ship at sea. Problems arising from the use of radar, radio, computers, repeaters, missiles, fire control and high pressure steam systems require special knowledge that must be delegated to different individuals. Therefore, the commanding officer must have experts in these fields aboard ship. How then can the commanding officer measure the ship as

a whole to determine if it is ready to fulfill its mission and that all the equipment is in working order.

The military forces today have advanced the science of warfare and security to a point where specially trained manpower is required to maintain and operate it. Often a man has had no prior training in the field to which he is assigned and must obtain all of his technical training from military schools. When such a man is assigned to a unit, he is often the only person in the area or aboard ship at sea that has sufficient knowledge to repair a certain piece of equipment. Since he is the only expert aboard, how can the commanding officer know that he is repairing the equipment correctly? Even though he turns the "on" button and sees the results flash before his eyes, the commander cannot be certain the equipment is operating according to its design.

The modern electronic machines, fire control apparatus and other advanced sophisticated equipment aboard a ship are worth millions of dollars. Having this equipment sit idle because of inoperation or having it operate below standard is a waste of money, equipment and manpower.

The equipment of today's modern ship has a standard performance that is manifested in and required by the specifications of the contract. The commanding officer of a ship must have some method to ensure that this equipment is operating as designed and that the men assigned to repair and maintain this equipment are doing a proper job. He cannot be an expert in all types of equipment so he must have a means of comparing

various operating performances and standards to ensure reliability and proper longevity of the equipment.

Although manpower is assumed to be plentiful in the United States, men with the abilities needed for a particular job are scarce. Private industry bids competitively for men who have the capability to gain the knowledge of today's complex marvel gadgets. The military forces have trained thousands of men to repair and maintain the equipment peculiar to the military. Not only do the Armed Forces bid against each other for these men, they also have private industry to contend with after these men have finished their enlistment contracts. Business can out bid the military forces for a man's ability by simply promising more pay, usually after the military has proved the man's capability for the technical training that is in such demand today. The military spends much time and money to train a man and private industry gains this valuable asset at the expense of the taxpayer.

The sifting for qualified men to train in technical areas starts when a man first enters his basic training. He has little difficulty in getting the type of special training he wants, provided he has demonstrated his ability to learn these new skills. Once he is trained, he is assigned to a particular unit in the Navy and probably finds himself in a position where only about half of the allotted technicians are aboard. This undermanning of ships is not uncommon as the manpower to fill the billets is simply not available. Therefore the manpower available must be utilized in the most efficient manner possible in order to

fulfill all the job requirements of these specialists. Even in the non-technical areas an extreme shortage of manpower exists and there can be very little reduction in the non-technical work required of every man such as deck watches, security watches, mess cooking and routine record keeping.

The manpower problem in the military is a subject of its own and at present is under study for means of improvement. The manpower shortage does cause particular problems that can be met with more efficient use of the men available.

The cost of operating one operational ship, or squadron, for a year would be enough to keep a moderate sized business going. Costs of fuel, supplies, salaries, repairs and special expenses are costs of operation. The initial cost of the hardware and plants are not included in operations. The need for more economical operations is evident when it is realized that the Navy is operating more ships and aircraft on the same amount of money or less than in prior years. Many costs can be reduced by simple procedures that can be aided by the lowest rated man in the Navy.

Proper and preventative maintenance and more careful handling of equipment could cut down the enormous repair bills for parts, and increase the life of the equipment. By this method, complete replacement of equipment could be avoided and a more reliable and longer period of service could be obtained. Educational programs on proper use and maintenance of the equipment helps to reduce some of the costs. Constant

supervision by superiors could cut down needless costly repairs, if the supervisors were available. How then can a commanding officer stimulate or motivate his men into the proper frame of mind, to realize efficiency and reliability are required and must be obtained?

Today, in the Navy, a small revolution is going on. Improved methods of managing our resources, men and materials to maintain our fleet readiness are being devised.[1]

The Standard Navy Maintenance and Material Management System (3-M System) was started by the Chief of Naval Operations to provide the proper tools for the new management era. The tool for the ship's commanding officer, and the foundation for the 3-M System, is the Planned Maintenance System which will be described briefly here and in detail in Chapter II of this paper.

Maintenance and Material Management

The standard Navy Maintenance and Material Management System (3-M) basically consists of two major programs. These two programs are:

A - Program Milestone Plan A. -- The development and implementation of a standard system for management of planned maintenance throughout the operating forces. The system will emphasize maximum practical maintenance at the lowest (ship, squadron and station) echelon. The systems incor-

---

[1]U. S. Department of the Navy, Maintenance and Material Management, Vol. I: Shipboard Maintenance, October, 1964.

porated in this plan are actually extensions of maintenance systems now in effect for ships and aviation units. They are:

1 - Planned Maintenance System for Ships.

2 - Maintenance Requirements Card System for Naval Aviation.

B - Program Milestone Plan B. -- The development and implementation of a uniform Maintenance Data Collection System in support of the Navy maintenance and material management program for ships and squadrons of the operating forces. The Maintenance Data Collection System envisions the uniform reporting of essential elements of information concerning each significant maintenance action throughout the operating forces. This will allow for a single mainline type of reporting and a central point for this information to be collected and disseminated.[2]

These two plans are to be developed simultaneously and implemented progressively into the fleet operating forces and aviation units. The assignment of responsibilities for implementation included in this plan are within the normal assignments of functions and responsibilities within the Navy Department. The overall progress in implementation will be monitored by the Maintenance and Material Management Project

---

[2]U. S. Department of the Navy, Navy Maintenance and Material Management Manual (Tentative), October, 1964.

Group and changes in scope and direction will be recommended to Deputy Chief of Naval Operation for Logistics as progress indicated the need.

The 3-M System will give the commanding officer and the top managers of the Department of the Navy the necessary data and reports from a single source. Standardizing the maintenance and reporting procedures will enable the manager to compare and measure the performance and maintenance of each unit against a standard. The feedback to the operating units from this data will give the commanding officer a tool with which he can better plan his maintenance problems, have better reliability of equipment, and more efficient use of the manpower he has available.

The whole plan is nothing more than getting the most effective use of the men and materials through proper management in order to place the Navy in a better Combat Ready Condition without the additional expenditure of funds.

The problem of securing the most effective use of funds allotted to a unit has long been recognized, but not until recently has this problem been approached from the standpoint of a standardized reporting system on maintenance and repairs coordinated at a central point, to allow for the proper feedback to the operators, so that the information generated from these reports could be utilized at the operating level.

CHAPTER II

MAINTENANCE AND MATERIAL MANAGEMENT

The Chief of Naval Operations in January 1963 convened a project group to recommend to Deputy Chief of Naval Operations (Logistics) a plan of action to improve the management of maintenance and material resources in support of the Operating Forces of the Navy. Involved in the approach of the group were:

1 - Efforts to concentrate management of maintenance within each command as an entity.

2 - Simplify the many different philosophies and the numerous reports associated with equipment groupings under the various technical bureaus.

The project group submitted a recommendation to Deputy Chief of Naval Operations (Logistics) encompassing two maintenance plans already in use. These plans included:

1 - Planned Maintenance System for Ships.

2 - Maintenance Requirement Card System for Aviation Units.

In addition a program was included for data gathering and feedback of information from data digested in a central location to the operating units as a tool to aid in the management of maintenance.

These programs were approved by the Chief of Naval Operations (Logistics) and were commenced simultaneously by the issuance by Chief of Naval Operations of OPNAVINST 4700.16A dated 1 August 1963.

The overall plan of implementation consists of two parallel programs called:

1 - Program Milestone Plan A.

2 - Program Milestone Plan B.

Program Milestone Plan A

The basic concept followed in this plan consists of fleetwide extension of a planned maintenance system. This is referred to as the "Planned Maintenance System." In the Naval Aviation Units the plan is an extension of the Maintenance Requirements Card System that is presently in use on newer types of aircraft.

This plan introduces these concepts in a series of action milestones, A1.0 through A7.0[1] which encompass only four major efforts but include separate recognition of the air operating forces. These major efforts are:

I - Development of Preventive Maintenance Documentation.

The development of a standard maintenance documentation requires the establishment of a standard format for documentation and distribution throughout the operating forces (Task A1.1).[2] The standards to be

---

[1]Appendix I, pp. 67-89.

[2]Appendix I, p. 69.

used will be determined through a very close examination of existing documentation and more recent developments incorporated in the Planned Maintenance System, programs previously initiated independently by the Bureau of Naval Weapons and the Bureau of Ships.

The development and evaluation of standard preventive maintenance documentation for all shipboard systems throughout the operating forces requires a major effort in the Bureau of Ships and the Bureau of Naval Weapons. The development of preventive maintenance forms requires the review of all sources of requirements for maintenance such as bureau manuals, manufacturers instruction books, fleet and type commander's instructions, preventive maintenance manuals already in use and all other requirements placed on the operating forces for preventive maintenance reports. These will be used to sort out, tabulate and evaluate all the requirements. Evaluation will require a critical examination of requirements to eliminate unnecessary and useless material and to ensure that all necessary requirements (skills, materials, procedures, time, tec.) are included in the documents approved. This is being accomplished concurrently aboard ship by the Fleet Work Study Groups working in coordination with the Bureaus to ensure that procedures, times, skills and materials are consistent with the skills, manpower and materials available in the operating forces. When completed, all preventive maintenance documents will provide the basis for installation of a standard shipboard maintenance management system.

The Aircraft Maintenance Requirement Card System satisfies and is in accordance with the management principles and concepts established for a standard system for management and accomplishment of preventive maintenance (Appendix II).[3] The standardization of this card was authorized 23 July 1964 by Chief of Naval Operations in the issuance of OPNAV 4700.17A which states:

> The purpose of this Instruction is to prescribe the essential elements of information, and the minimum standards for presenting preventive maintenance requirements in document form, for use within the ships of the operating forces. The standard document will be referred to and titled 'Maintenance Requirement Card.' OPNAV Form 4700.1.[4]

II - Development of Uniform Standards of Maintenance Planning, Control and Recording

The development of a standard maintenance management system requires the determination of the definition of the basic elements of such a system. (Task A3.0).[5] To accomplish this task a comprehensive review of the Planned Maintenance System currently in operation in the Atlantic and Pacific Fleets was evaluated. In addition, the requirements for record keeping within a ship in support of the maintenance function was determined by means of a Fleet Work Study Project carried out during the service test of the maintenance data collection system afloat.

---

[3]Appendix II, p. 91-95.

[4]U. S. Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 4700.17A, 23 July 1964, p. 1.

[5]Appendix I, p. 72.

Currently, detailed instructions governing maintenance administration, planning, control and record keeping are documented in Bureau of Naval Weapons directives which set forth the Naval Aircraft Maintenance Program. However, these policies and procedures have undergone major revisions in order to reflect and be compatible with improved availability of maintenance management data collection and machine processing.

III - Installation of Standard Maintenance Management Throughout the Operating Forces

The installation of a standard shipboard maintenance management system throughout the operating forces (Task A5.0),[6] will proceed in accordance with the scheduled development of preventive maintenance documentation under Task A1.0. The basic concept underlying the planned schedule is to derive the greatest benefit to the largest number at the earliest date possible. The installation process in regard to a particular ship or unit is simple. However, the installation of this system in a large number of ships in a short period of time is quite a problem and will require training a large number of installation teams. The Fleet Type Commanders will be required to supply these short term personnel to meet the planned schedule of installation.

The installation of the standard aviation planned maintenance management system throughout the operating forces and shore establishment (Task A6.0)[7] will be conducted coincident with the installation of

---

[6] Appendix I, p. 74.

[7] Appendix I, p. 75.

the standard maintenance data collection system. Installation within Fleet, FleetMarine Force and Shore Establishment maintenance activities commenced on a planned basis in January 1964 and is to be completed early in 1965.

IV - Development of a System to Control the Standard

The development of a system for control of the standard maintenance management system (Task A7.0)[8] consists of:

A. Revising new equipment/new system procurement specifications to provide adequate preventive maintenance documentation.

B. Including the evaluation of equipment maintenance requirements during fleet evaluation.

C. Installing a standard maintenance management system in new ship construction.

D. Controlling the preventive maintenance documentation throughout the operating forces.

Program Milestone Plan B

The basic objective in the establishment of a maintenance data collection system is to provide required information and statistics as a basis upon which managers can effectively and efficiently manage the Navy's maintenance and material resources. Studies of the U. S. Air Force Maintenance Management System indicate that the principles and procedures of data collection contained therein are capable of adaptation to the overall Navy requirement. The adaptation will be compar-

---

[8]Appendix I, p. 76.

atively direct in Naval Aviation; however the adaptation to ships will require certain modifications. The system that is being developed will be one which is considered to contain the best balance of management versus technical data requirements.

The first requirement of Plan B was to determine the Navy Maintenance Data Collection System requirement (Task B1.0).[9] It was considered feasible to accomplish this task in the stated time frame based on the assumption that the U. S. Air Force Maintenance Management System contained the essential management principles and that these principles could be adapted to the Navy system. During the time frame, an actual service test was conducted within the surface force and aviation environment. It was planned that these tests and the formal review scheduled to begin October 1963 and completed by April 1964 would provide the opportunity to make necessary adjustments and refinements prior to installation fleetwide. These tests provided the opportunity to define management responsibilities, functions, and information required at each management level in the Fleet and in the Bureaus, and at the same time provide an opportunity to establish documented procedures for Navy-wide application.

The accomplishment of this task is the responsibility of the Maintenance and Material Management Project Center, under the direct control of the Chief of Naval Operations. Personnel representing Naval

---

[9]Appendix I, p. 82.

Surface Forces, Naval and Marine Aviation, and technical advisors from the U. S. Air Force have been assigned to this center. It will be the mission of the Project Center to perform the day-to-day tasks associated with implementing the overall Staff Working Group plans. The Project Center has been organized with three functional areas:

1 - Data Collection

2 - Data Processing

3 - Data Analysis

Functions performed in the Data Collection area will include:

A - Providing "Mobile Training Teams" to the ships and air stations selected for service testing to train Maintenance personnel in the mechanics of implementing the Exception Time Accounting and Maintenance Data Collection System.

B - Monitoring the evaluation activities after the implementation of Exception Time Accounting and Maintenance Data Collection to determine problem areas and elements not compatible with Navy organization and procedures.

C - Altering Exception Time Accounting and Maintenance Data Collection forms and procedures as required to develop the Navy Maintenance Data Collection System.

Functions performed in the Data Processing area will include:

A - Providing designated service test activities with Electronic Data Processing/Electronic Accounting Machine Procedures and equipment required to process data.

B - Provide training for Electronic Systems and key punch operators as required.

C - Determine data analysis methods to be utilized in the Navy Data Collection System.

For purposes of the total project effort, the service test of Maintenance Data Collection System for Naval Aviation (Task B2.0)[10] has been accomplished by expanding the test currently in progress at Naval Air Station (NAS) Oceana. This limited test has proven the feasibility of collecting, processing, and analyzing required data at a Naval Shore Activity. In addition, the plan is being expanded to all squadrons of a designated Carrier Air Group when ashore and in a designated aircraft carrier, thus carrying the test aboard ship. By April 1964, all squadrons at NAS Oceana and one Marine Air Group were trained and placed on the Exception Time Accounting and the Maintenance Data Collection Systems. In addition the NAS Oceana Supply Department was mechanized to provide requisite supply support. (See Figure I).

The shipboard test plan was based on the selection of the destroyer ship class as a counterpart to the aircraft. For this service test it was planned to utilize designated destroyer squadrons and tender repair departments reporting "on equipment maintenance."[11] The data generated in each ship was key punched and edited. It was then forwarded to the data

---

[10]Appendix I, p. 83.

[11]Note: For the purposes of this paper fictitious numbers will be assigned to the test squadron and ships involved.

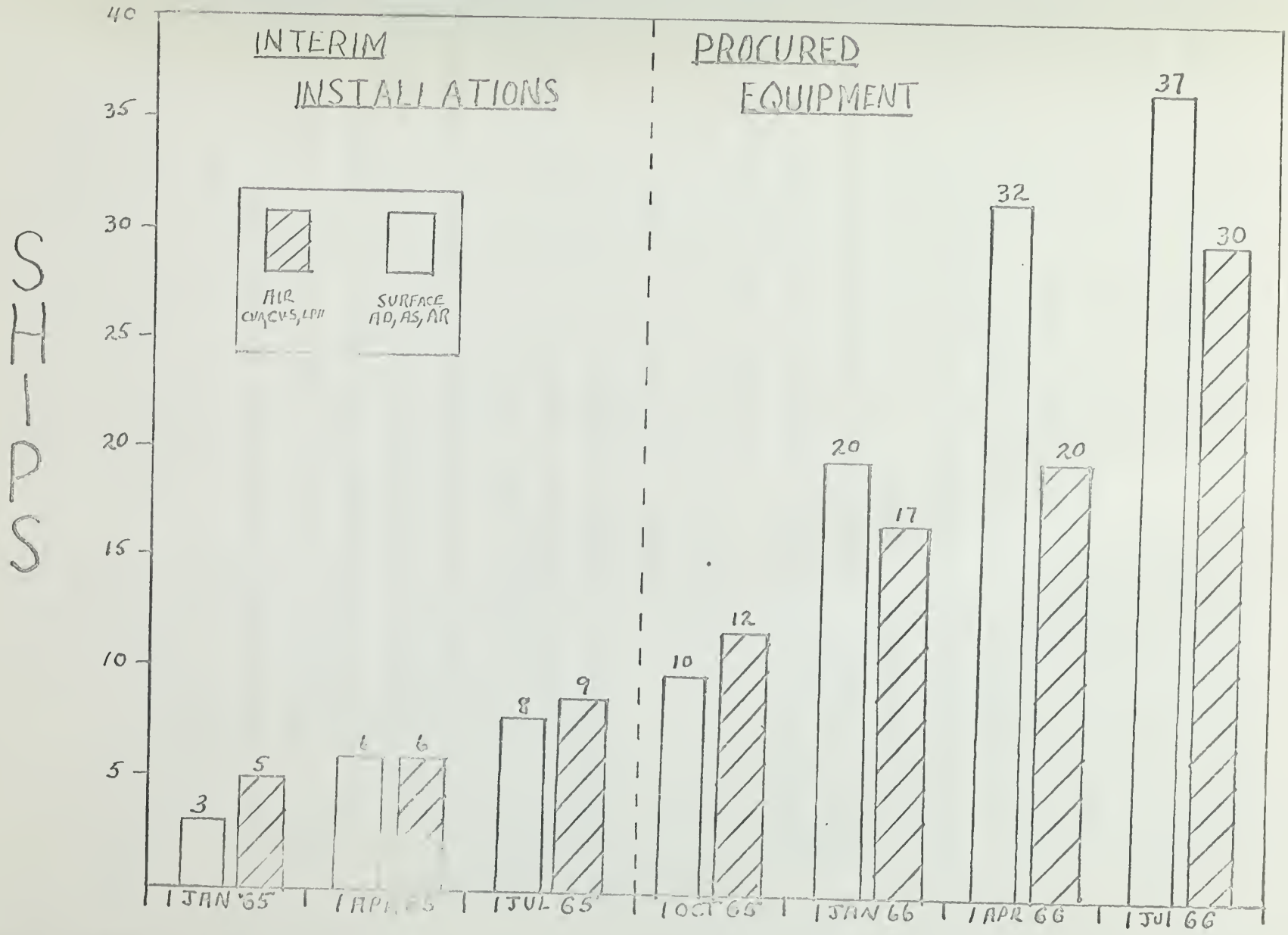

ADP INSTALLATION SCHEDULE
SHIPS
40
35
30
25
20
15
10
5
INTERIM INSTALLATIONS
PROCURED EQUIPMENT
AIR CV/AC VS, LPH
SURFACE AD, AS, AR
3
5
6
6
8
9
10
12
20
17
32
20
37
30
JAN '65
APR 65
JUL 65
OCT 65
JAN 66
APR 66
JUL 66

Figure 1

processing facility in the tender where it was machine-processed to produce the required management reports. Shipboard procedures and instructions were prepared, instructors and implementing personnel qualified and trained, and ships company, both reporting ships and tender, were also trained. Work Unit Code Manuals were prepared and Electronic Data Processing Machine equipment was installed. By initiating data collection during August 1963 and utilizing several reporting ships and one tender for shop repair effort, a period of six months during the formal service test was available for adjusting and refining procedures.

In order to be able to define an overall Navy Data Collection System (Task B4.0)[12] which includes:

1 - A definition of management responsibilities,

2 - A definition of management functions,

3 - A definition of information required at each management level. This task encompasses the conduct of a formal review of both the air and surface trial. During the six month formal service test the Staff Working Group depended heavily on the capabilities of the Maintenance and Material Management Center, Fleet and Type Commanders, and testing activities.

The final Navy Automatic Data Processing System is the result of the formal service test. This effort had to, of necessity, recognize all existing systems requiring data produced by machine methods. Currently the several technical bureaus have established mechanized data collection systems. Implicit in this task is the requirement to investi-

---

[12]Appendix I, p. 85.

gate these existing systems with the objective of consolidation into a single data collection and automated data processing system. In order to accomplish this task it must be recognized that adequate in-house Navy capability does not exist. This can only be accomplished by a highly qualified government-industry team in which the industry participants must have a thorough knowledge of current Navy requirements and procedures as well as the capability to respond at a very early date to the generated requirements.[13]

During the period 1 October 1963 to 1 April 1964 the Navy Data Collection System requirements were defined. Also, during this period, implementation of the Navy System commenced in the form of planning, training, electronic data process machine acquisition, and finalization of detailed instructions as requirements are conferred. Starting in April 1964, the Navy System was implemented on a progressive basis. It was to have included all Naval Air activities by January 1965 and all surface force activities by January 1966 with 100% completion of installations in late 1966. (See Figure 2 for schedule.)

---

[13]U. S. Department of the Navy, Office of the Chief of Naval Operations, OPNAV INSTRUCTION 4700.16A, August 1963.

INSTALLATION SCHEDULE

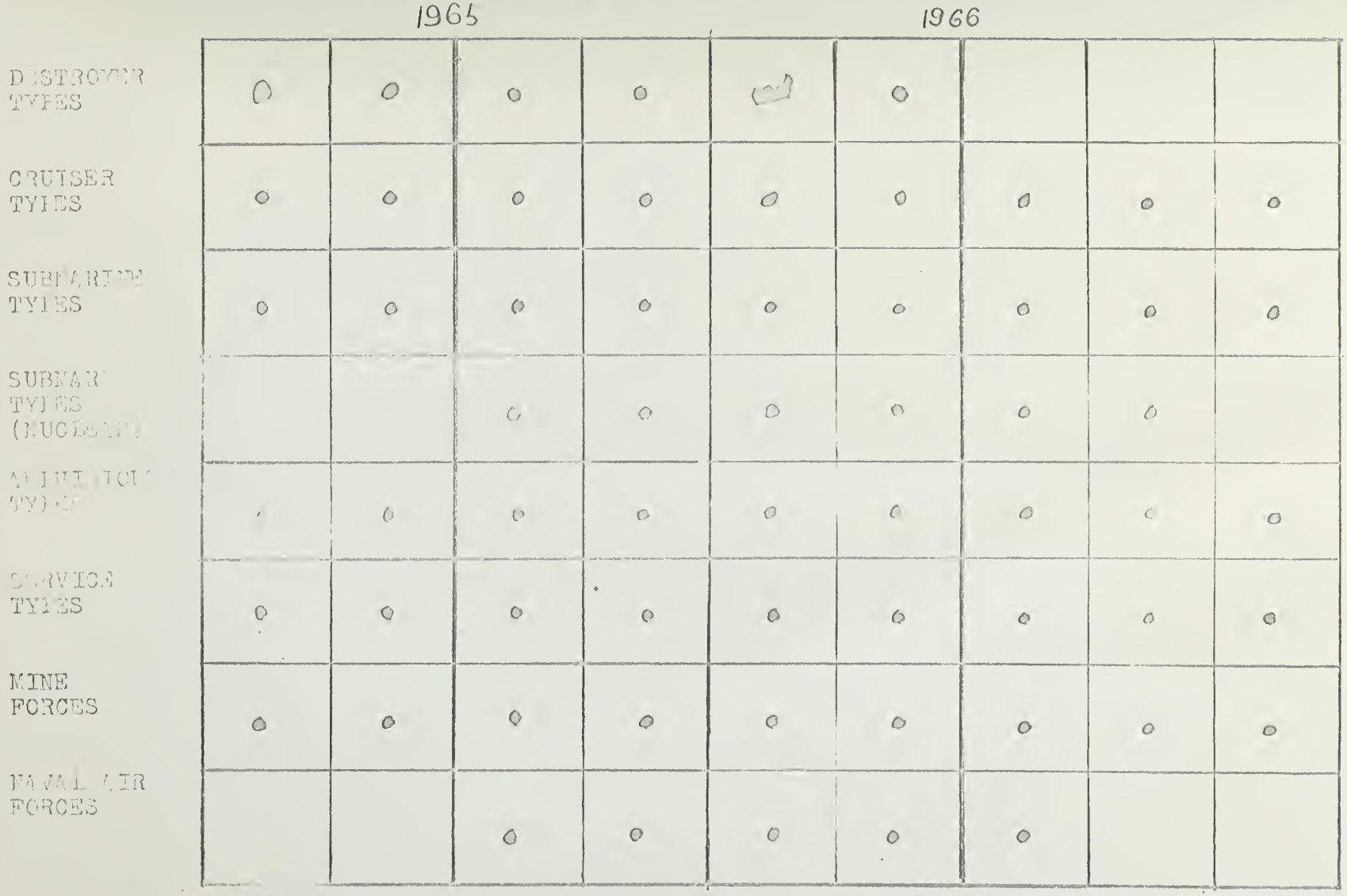


Figure 2

CHAPTER III

PLANNED MAINTENANCE SYSTEM

The formulation of the 3-M program[1] relies heavily on existing maintenance programs. These are:

1 - Planned Maintenance Systems for shipboard use.

2 - Maintenance Requirements Card for aviation use.

The author for the remainder of this paper will concentrate on the shipboard aspect to illustrate the overall program in operation.

What is the Planned Maintenance System? It is a tool for:

1 - Availability of equipment for mission support.

2 - Reliability of equipment without compromise of schedule or quality.

3 - Full service life of equipment at a minimum of cost.

4 - Maximum utilization of skilled personnel.

5 - Control for quick reaction to changes.

Control is one of the most important elements of management, yet is the one feature required by a manager that is most lacking. Flexible control available in the Planned Maintenance Systems emphasizes the vital

---

[1]Maintenance and Material Management.

difference between haphazard maintenance procedure and a planned and managed maintenance program.

In this program a simple set of forms have been designed to eliminate much of the paper work that has often bogged down such programs in the past. The tools of the system designed to make the program simple, concise and on a level that everyone can understand are:

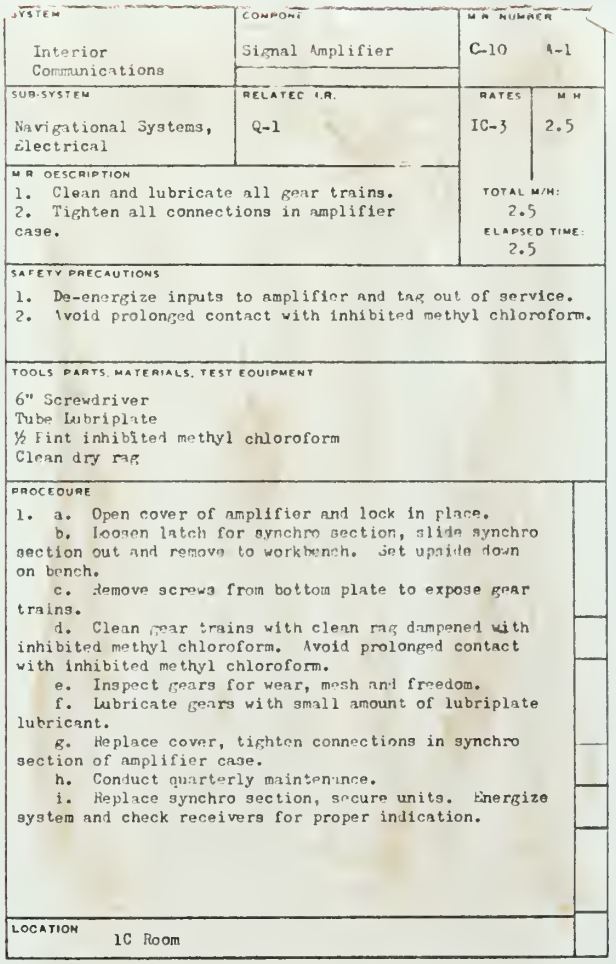
1 - Equipment List. -- Lists all maintainable items aboard the ship. During the installation of the system aboard a ship the lists will be checked against all equipment aboard.

2 - Maintenance Requirement Card.[2] -- The Maintenance Requirement Card (referred to as MRC) is a 5" X 8" card designed for the detailed guidance of maintenance personnel performing a specific preventive maintenance task on a specific item of equipment. In addition to detailed instructions to the personnel performing the maintenance (tools and parts required and step-by-step procedures), it also lists information needed by supervisory and scheduling personnel (frequency of accomplishment, minimum skill levels required and time to accomplish).[3] A complete deck of all MRC's for planned maintenance tasks on all equipment in a shipboard department will constitute a completed and detailed guide to all maintenance actions that can be anticipated, planned for and scheduled in advance. These complete MRC decks will eliminate the necessity for and replace portions of maintenance publications insofar as preventive maintenance is concerned.

---

[2]Appendix II, p. 91.

[3]See Figure 3 for a complete example.



SYSTEM	COMPONENT	M R NUMBER
Interior Communications	Signal Amplifier	C-10 A-1
SUB-SYSTEM	**RELATED M.R.**	**RATES / M H**
Navigational Systems, Electrical	Q-1	IC-3 / 2.5

M R DESCRIPTION

1. Clean and lubricate all gear trains.
2. Tighten all connections in amplifier case.

TOTAL M/H: 2.5
ELAPSED TIME: 2.5

SAFETY PRECAUTIONS

1. De-energize inputs to amplifier and tag out of service.
2. Avoid prolonged contact with inhibited methyl chloroform.

TOOLS PARTS, MATERIALS, TEST EQUIPMENT

6" Screwdriver
Tube Lubriplate
½ Pint inhibited methyl chloroform
Clean dry rag

PROCEDURE

1. a. Open cover of amplifier and lock in place.
   b. Loosen latch for synchro section, slide synchro section out and remove to workbench. Set upside down on bench.
   c. Remove screws from bottom plate to expose gear trains.
   d. Clean gear trains with clean rag dampened with inhibited methyl chloroform. Avoid prolonged contact with inhibited methyl chloroform.
   e. Inspect gears for wear, mesh and freedom.
   f. Lubricate gears with small amount of lubriplate lubricant.
   g. Replace cover, tighten connections in synchro section of amplifier case.
   h. Conduct quarterly maintenance.
   i. Replace synchro section, secure units. Energize system and check receivers for proper indication.

LOCATION IC Room

MAINTENANCE REQUIREMENT CARD
OPNAV FORM 4700-1 (Rev. 1-64)

Figure 3

3 - Cycle Schedules.[4] -- The Cycle Schedules for a ship show all planned maintenance actions (except weekly or daily actions) by item of equipment and by quarter in which performed. The time frame covered by the Cycle Schedule is the entire period between overhauls for a particular

[4]Appendix II, p. 92.

class of ship as prescribed by higher authority.[5] Since a Cycle Schedule is prepared for each Maintenance Group in a ship, its use will permit equalization of the Maintenance Group's preventive maintenance workload throughout the overhaul cycle.[6] The Fleet Work Study Group will assist the type commander in preparation of the initial Cycle Schedules for the prototype ships and the type commander will prepare the schedule for subsequent ships under his control.

4 - Quarterly Schedules.[7] -- From the Cycle Schedule, the department head will prepare Quarterly Schedules, for current and subsequent quarters. The Quarterly Schedule serves as a directive for maintenance group supervisors in scheduling weekly maintenance. It also serves as a permanent ship's record, at the end of the quarter, of the planned maintenance accomplished or not accomplished.

5 - Weekly Schedules.[8] -- From the Quarterly Schedules, maintenance group supervisors will prepare Weekly Schedules specifying personnel by name, to accomplish the actions required by specific Maintenance Requirement Cards for each day of the week. Scheduling of recurring daily or weekly maintenance actions, not specified in the Cycle or Quar-

---

[5]The overhaul schedules for a class of ship are currently described in OPNAV 4700.7 series of Instructions. The latest revision to this series should be checked to find a particular overhaul schedule.

[6]Typical maintenance groups in the Engineering Department of a Destroyer are Forward Engineroom, After Engineroom, Forward Fireroom, After Fireroom, Electrical, Internal Communication, Auxiliary, and Shipfitters.

[7]Appendix II, p. 93.

[8]Appendix II, p. 94.

terly Schedules, will also be accomplished by the Weekly Schedule. At the end of the week all work scheduled will be shown on the Quarterly Schedule as accomplished or not accomplished.

6 - Manual Index Pages.[9] -- Upon completion of preparation of a set of Maintenance Requirement Cards for any given item of equipment, a Manual Index Page will be prepared, by the Technical Bureau, listing all MRC's for that particular equipment plus essential scheduling information. Figure 4 illustrates a completed Maintenance Index Page of a Planned Maintenance System Manual. The Maintenance Index Page illustrated is for a Portable Gasoline Driven Pump.

Manual index pages will be numbered with a capital letter or number designation for the appropriate system followed by a non-significant page number within the system. Manual index pages prepared to replace an existing page shall bear the same page number as the original. A new issue date will be inserted at the bottom of the page. When Manual Index Pages are completed for an equipment on a ship they will become a part of the ship's Planned Maintenance System Manual. These pages will then provide the basic sources of information from which department heads, division officers and leading petty officers can schedule preventive maintenance.

The control over the maintenance program for a particular ship is positive. The officer and men can see what has to be done, when it has to be done, who is to do it and when and if the job was completed.

---

[9]Appendix II, p. 95.

SYSTEM, SUB-SYSTEM OR COMPONENT	INDEX PUBLICATION
PORTABLE GASOLINE DRIVEN PUMP P500	NAVSHIPS 347-0001

BASIC ALLOWANCE [illegible]	MAINTENANCE [illegible]	M. R. NO.	RATE REQUIRED	MAN HRS	PLANT MAINTAINED
AG ZZGFPJ6 A3 0352 M	1. Start pump to insure operation.	M-1	DC3	0.3	Q-1
AG ZZGFPJ6 A3 0353 Q	1. Test operate pump under load.	Q-1	DC3 FN	0.8	M-1
AG ZZGFPJ6 A3 0354 A	1. Inspect spark plugs, clean and adjust. 2. Inspect breaker points, clean and adjust. 3. Inspect flywheel for tightness.	A-1	DC3	1.0	
AG ZZGFPJ6 A3 0355 R	1. Flush out pump with fresh water.	R-1	DC3 FN	0.8 0.8	M-1

MAINTENANCE INDEX PAGE — BREAK PAGE CONTROL NUMBER A 10
OPNAV FORM 4700-3 (4-64)

SAMPLE INDEX PAGE OF
PLANNED MAINTENANCE SYSTEM MANUAL
Figure 4

Using the Quarterly Schedule, a department head can plan the maintenance and manpower requirements to the best advantage. The weekly schedule is made up from the quarterly schedule, specifying assignments for specific personnel in his department. When the work has been completed, it is crossed off the schedule; if not completed, it is rescheduled to fit the time and manpower that will be available to use for maintenance.

The flexibility of the system allows for many contingencies. For instance, if Brown, Machinist Mate 3, is sick today and is unable to perform his scheduled maintenance assignment, a look at the weekly schedule will show that Green, Machinist Mate, Fireman, is capable of doing the job and has the time available. Also if neither Green nor anyone capable were not available, the job would be rescheduled for the next day or later. By knowing months or quarters in advance what the maintenance requirements will be, the division officer will have ample time to plan ahead and make changes when required. If the schedule calls for a quarterly maintenance assignment on a particular piece of equipment but operating requirements will not permit, there are still two months left in the quarter to complete the scheduled maintenance.

Simplicity is the key feature of the Planned Maintenance System. Staff workload is reduced and a heavy load of paperwork is eliminated. Indecision is eliminated as clear instructions are furnished as to what is to be done, when, where, by whom, how much time it will take and with

what tools it can be accomplished. Everybody from top to bottom knows what is to be done and if it is done.

The Planned Maintenance System is standardized and therefore will eliminate many of the overlapping and controversial instructions that have existed in the past and caused much confusion throughout the operating forces.

CHAPTER IV

DATA COLLECTION SYSTEM - SHIPBOARD

The data collection is really the only new part of the 3M program that is entirely new. The other parts of the program were in existence and were extended or revised to fit into the overall program for management.

The Maintenance Data Collection System is designed to provide a means of recording maintenance actions in detail so that a great variety of information may be retrieved concerning maintenance action and the performance of equipment involved.

In addition to recording maintenance actions performed the system further provides data concerning when the need for maintenance was discovered, how equipment malfunctioned, how many manhours were expended, which equipment was involved, what delays were incurred, the reasons for delay, and the technical specialty or rating which performed the maintenance.

The Maintenance Data Collection System provides a document for recording, at the source and by maintenance personnel, information concerning planned and corrective maintenance. This information is recorded by means of codes to permit machine processing. Each maintenance action is reported. A maintenance action is any corrective or preventive action taken to maintain or restore equipment or material to satisfactory operating

condition. The action consumes manhours or material or both. Routine planned preservation and daily or weekly planned maintenance check actions are not to be reported.

The three documents used to record maintenance actions are described briefly below.

1. OPNAV Form 4700-2B. (Shipboard Maintenance Action.) A single copy form used to record maintenance actions on board a ship/activity.

2. OPNAV Form 4700-2C. (Work Request.) A four part form used as a work request or a request for outside assistance and for final documentation of action taken to complete the maintenance requested of the repair activity.

3. OPNAV Form 4700-2D. (Deferred Action.) A two part form used to record a maintenance action which is deferred because of ship operations, lack of spare parts, or the need for outside assistance. The effectiveness of the system depends on the individual worker performing and reporting the maintenance action, accurately and completely to a data collection center or focal point for the Maintenance Data Collection organization, which will be established aboard each ship or activity. Work Center Supervisors are responsible for ensuring that all maintenance data forms are complete and accurate and that a document is submitted for each applicable action. A listing of errors will be prepared periodically by the Maintenance Support Office showing the type of errors and the work centers responsible. This listing will be sent to each command to assist in training and evaluation of documentation.

A more detailed description of organization, documents and documentation flow will be found later in this chapter.

The installation of the Maintenance Data Collection System aboard ship requires no change to existing shipboard organization. A central, functional maintenance control will be designated by the commanding officer and will be responsible for ensuring accuracy and completeness of all documents prior to transmittal. Further amplification and guidance in maintenance control functions will be promulgated by higher authority.

Activities or ships that are designated for machine processing services will have a data processing section. Staffing of this section will be determined by local conditions and further amplified by type or area commander requirements.[1]

Figure 5 illustrates the flow of information collected by the Maintenance Data Collection System of the 3-M program. The basic document is prepared aboard a ship and forwarded to the tender or activity designated to convert the information into form for machine processing. From this point the information goes to a central maintenance support office which maintains the master files. From here the overall reports required and requested by various commanders, technical bureaus and the ship itself are prepared and forwarded.

The use of a single center to prepare these reports from a single source from the ships enables the wholesale reduction of paperwork and

---

[1]U. S. Department of the Navy, Navy Maintenance and Material Management Manual (tentative), October, 1964.

3M INFORMATION FLOW

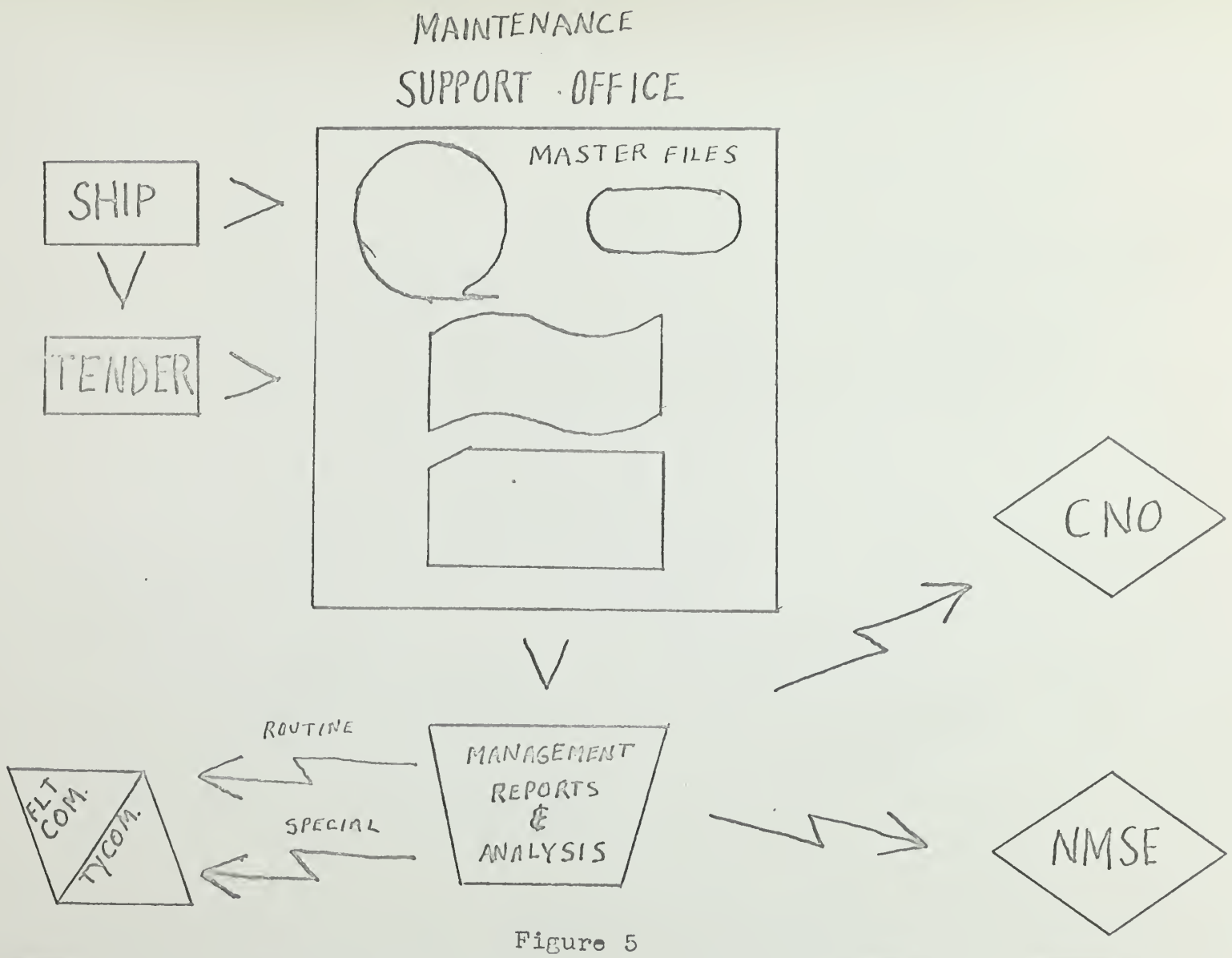


Figure 5

allows more reliable information to be gathered and machine processed than would be possible to accomplish aboard each individual ship.

Documentation and Flow of Documentation

The following information is related to filling out Form 4700-2B (see Figure 6, page 35) and Form 4700-2D (Figure 8, page 37). In addition to the sample forms a flow chart indicating the processing steps of each of these documents follows the forms in Figure 7, page 36 for Form 4700-2B and Figure 9, page 38 for Form 4700-2D.

I -- Form 4700-2B and Form 4700-2D.

BLOCK A -- Ships Name and Hull Number.
Example: USS BLOT DD 999.

BLOCK 1 -- Administrative Organization.
Example: A ship assigned to Desron 14 would be entered as D 140.

BLOCK 2 -- Ships Accounting Number. This accounting number is obtained from NAVCOMPT Manual, Volume II, Chapter 5.
Example: 05772

BLOCK 3 -- Maintenance Control Number. This four digit entry is made for document control purposes. The number shall be assigned consecutively, beginning with 001 and ending at 9999 within the fiscal year.

BLOCK 4 -- Date. Enter day, month and year the maintenance is accomplished, or in case of a work request, the date the request is submitted.
Example: 28 08 4 (28 Aug. 1964).

BLOCK 5 -- Equipment Identification Code. Enter from the Equipment Identification Code Manual (EIC) the appropriate seven letter number code which identifies the system, subsystem, component and/or lowest designated assembly on which maintenance is performed.
Example: ZP01000.

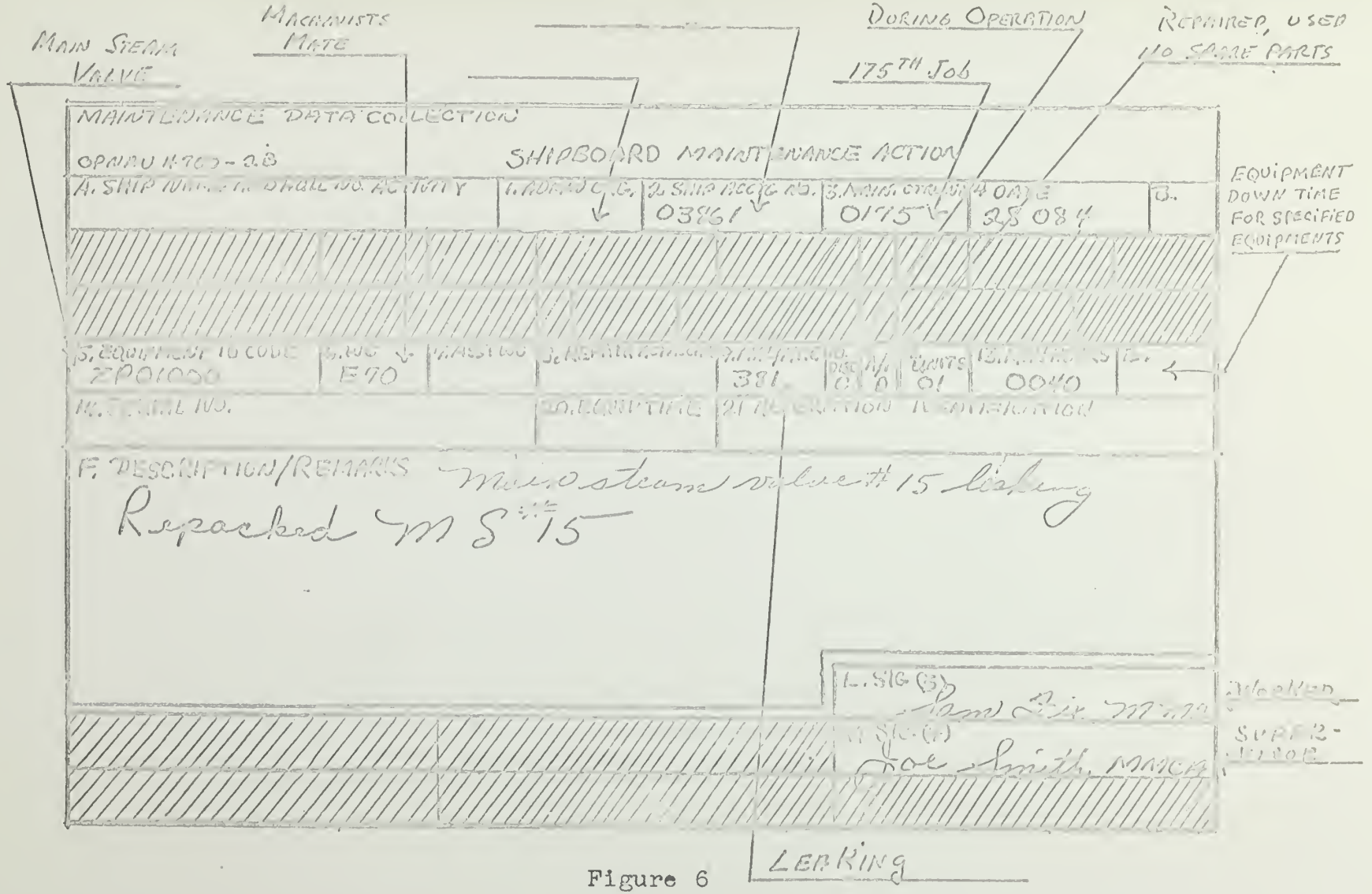

MAIN STEAM VALVE
MACHINISTS MATE
DURING OPERATION
175TH JOB
REPAIRED, USED NO SPARE PARTS
MAINTENANCE DATA COLLECTION
OPNAVINST 4790-2B
SHIPBOARD MAINTENANCE ACTION
A. SHIP MAINT. ENGR. DWELLING ACTIVITY
1. WORK C.C.
2. SHIP RECD NO.
3. MAIN. CTR. NO.
4. DATE
03861
0175
38 08 4
EQUIPMENT DOWN TIME FOR SPECIFIED EQUIPMENTS
5. EQUIPMENT ID CODE
6. ENG
7. ASSY NO.
8. REPAIR PART
9. PART NO.
10. DISC
11. UNITS
12. MAN HRS
13.
EP01000
E70
381
01
01
0040
14. SERIAL NO.
15. DESCRIPTION
16. ACTION TAKEN
F. DESCRIPTION/REMARKS
Main steam valve #15 leaking
Repacked MS #15
L. SIG (S)
Sam Fix MM3
Machinist
M. SIG (S)
Joe Smith, MM1(A)
Supervisor
LEAKING

Figure 6

FUNCTIONAL FLOW DIAGRAM
MAINTENANCE DOCUMENT (OPNAV FORM 4700-2B)

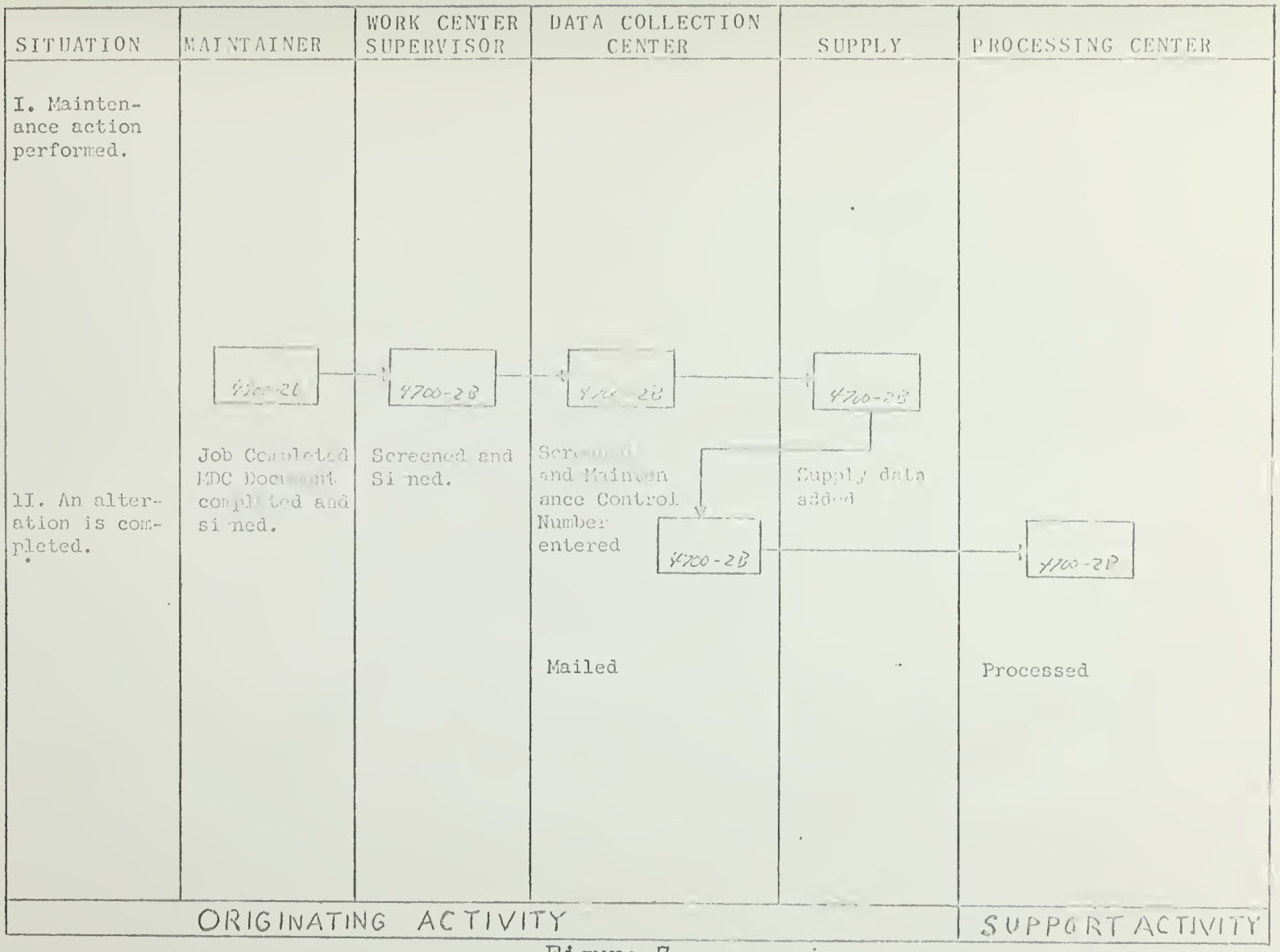


Figure 7

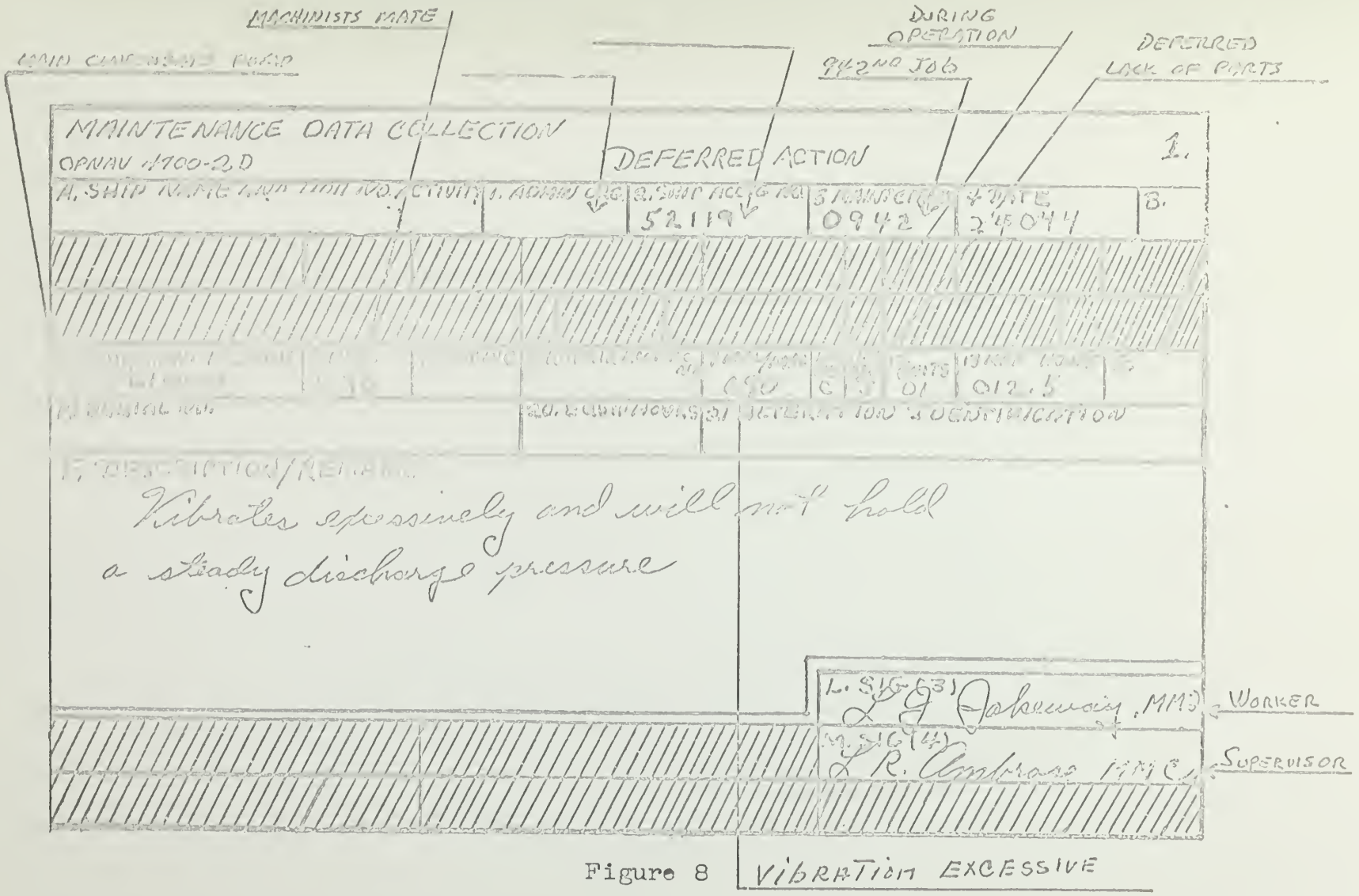

MACHINISTS MATE
DURING OPERATION
DEFERRED LACK OF PARTS
MAINTENANCE DATA COLLECTION
OPNAV 4700-2D
DEFERRED ACTION
1.
0942
2405
B.
Vibrates excessively and will not hold a steady discharge pressure
L. SIG (3) J Johnson, MM3
WORKER
L. R. Ambrose
SUPERVISOR
VIBRATION EXCESSIVE

Figure 8

FUNCTIONAL FLOW DIAGRAM
DEFERRED ACTION DOCUMENT (OPNAV FORM 4700-2D)
(operations or spare part deferral)

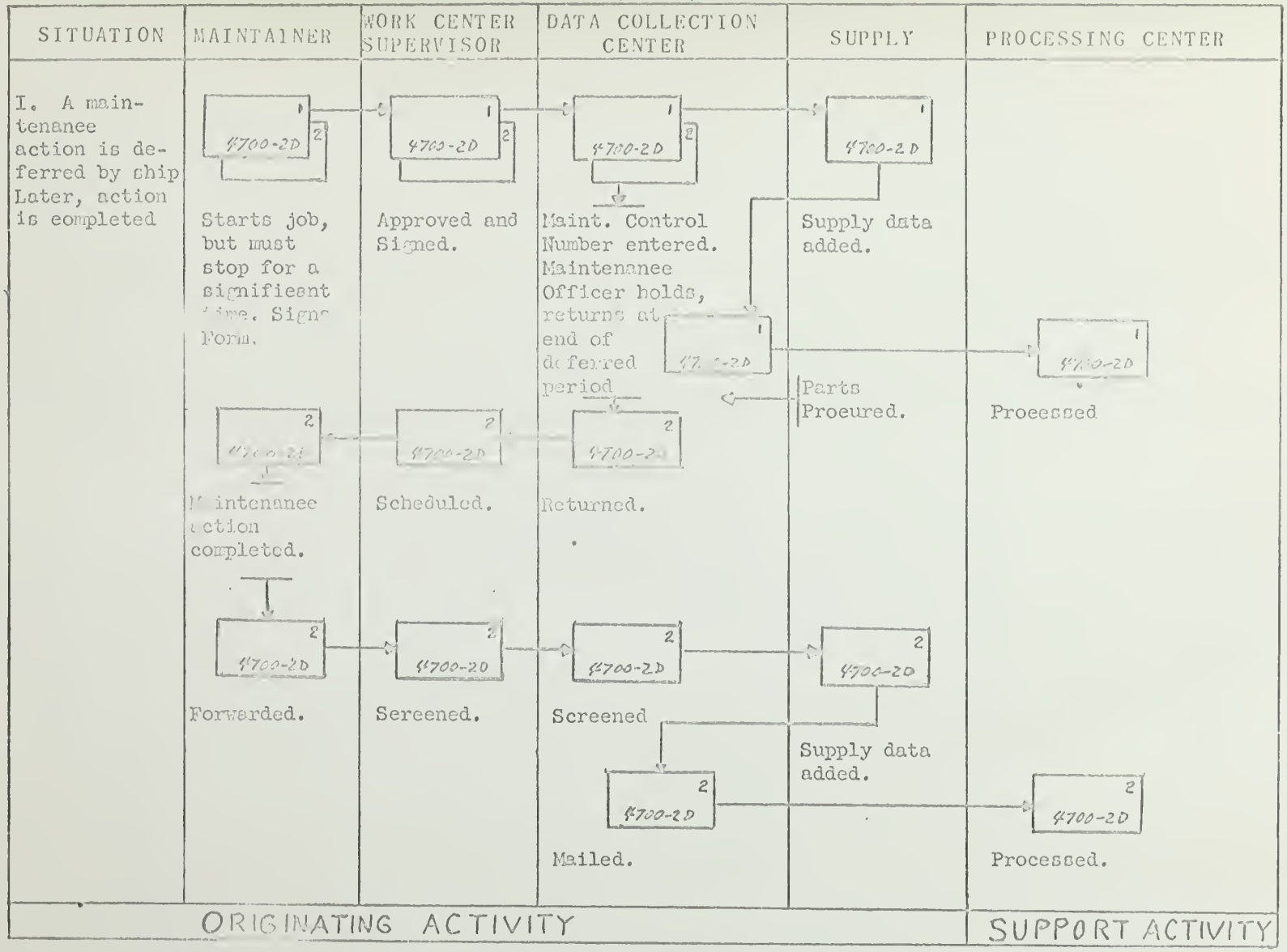


Figure 9

BLOCK 6 -- Work Center. Enter the three letter number code from Appendix B of Navy Maintenance and Material Management Manual.
Example: E 70 (Engineering Department, Machinist Mate).

BLOCK 7 -- Assisting Work Center. This block will be filled out only when assistance is received from an activity not under the Maintenance Data Collection System.
Example: Civilian Contractor.

BLOCK 8 -- Repair Activity Account No. Leave Blank.

BLOCK 9 -- How Malfunction/Maintenance Requirement Card. Enter the three digit code from Appendix C of Navy Maintenance and Material Management Manual, which describes best the trouble found.
Example: 381 (Leaking).

BLOCK 10 -- Discovered. Enter the appropriate code from Appendix D of the Navy Maintenance and Material Management Manual the time the maintenance requirement was discovered.
Example: C (During equipment operation).

BLOCK 11 -- Action Taken. Enter from Appendix E of the Navy Maintenance and Material Management Manual, the code which best describes the maintenance action taken on the equipment identified in BLOCK 5.
Example: D (Repaired, no spare parts required.)

BLOCK 12 -- Units. Enter the number of identical items, identified in BLOCK 5, on which the same maintenance action was attempted or performed.
Example: 01.

BLOCK 13 -- Manhours. On completion of the maintenance action, enter the total manhours expended by all shipboard personnel to the nearest tenth of an hour.
Example: 0040 (4 manhours).

BLOCK E -- Equipment Down Time. This entry will only be made on specific equipment to be designated by separate OPNAV instructions.

BLOCK 14 -- Serial Number. Enter the equipment serial number on equipment specified under separate instruction. If the equipment does not have to be listed by serial number list a simple noun description of 13 characters or less.
Example: MT 51 (5" Gunmount #51).

BLOCK 20 -- Equipment Time. Enter to the nearest hour the equipment operating time at the time the malfunction is discovered, as obtained from installation or operating logs.
Example: 1531 (1531 hours of operating time).

BLOCK 21 -- Alteration Identification. If an alteration is to be completed, the Alteration Identification number is to be entered.

BLOCK F -- Description/Remarks. A brief description in simple terms of the malfunction occurring and action taken to correct it.
Example: Main steam valve #5 leaking. Repacked main steam valve #5.

BLOCK L -- #3 Signature. Signature of the person who actually performed the corrected or preventive maintenance.
Example: Sam Fix MM2.

BLOCK M -- #4 Signature. This block is used for the signature of the supervisor of the man that corrected the discrepancy and indicates the work was completed and the document submitted is complete and correct.
Example: Joe Smith MMCA. (Joe Smith MMCA is Sam Fix' immediate supervisor).

II -- Form 4700-20. Work Requests, form 4700-20, will be used by ships to request assistance from repair activities other than ship yards. Work requests will be submitted for repair activity assistance and for all scheduled availabilities. Work requests will be forwarded as directed by higher authority. The timely submission of work requests is to the advantage of the ship requesting assistance, since it permits the repair activity to schedule work, procure materials where feasible, assign any

availabilities necessary at other repair activities, and determine special time consuming problems.

OPNAV Form 4700-2C is a four part form and will be used in the manner discussed in the following paragraphs of this chapter. (See Figures 10, 11, 12 and 13 for examples of 4700.2C. See Figure 14 for a flow Chart of the processing of the data from Form 4700.2C.)

Block entries that are identical with Form 4700.2B and 4700.2D will not be described in this portion of this paper. For reference to these blocks see description of Form 4700.2B.

BLOCK C -- Leave Blank.

BLOCK 15 -- Leave Blank.

BLOCK 16 -- Requesting Work Center. Enter the three letter/number code that identifies the department, rating, shop or group that is requesting assistance from a repair activity. The work center codes may be found in Appendix B to Navy Maintenance and Material Management Manual.
Example: E 70 (Engineering Department Machinist Mate.)

BLOCK 17 -- Desired Completion Date. Enter the five number code that identifies the day, month and year the work must be completed by the repair activity.
Example: 29084
29 Aug. 1964.

BLOCK 18 -- Service. Enter the single letter code from Appendix G of Navy Maintenance and Material Management Manual to indicate the type assistance the requesting ship will furnish the repair activity in completing the requested maintenance.
Example: A (Deliver and call for.)

BLOCK D -- Leave Blank.

BLOCK G, H, and J -- Contacts. Enter the name and rate of three leading petty officers who are familiar

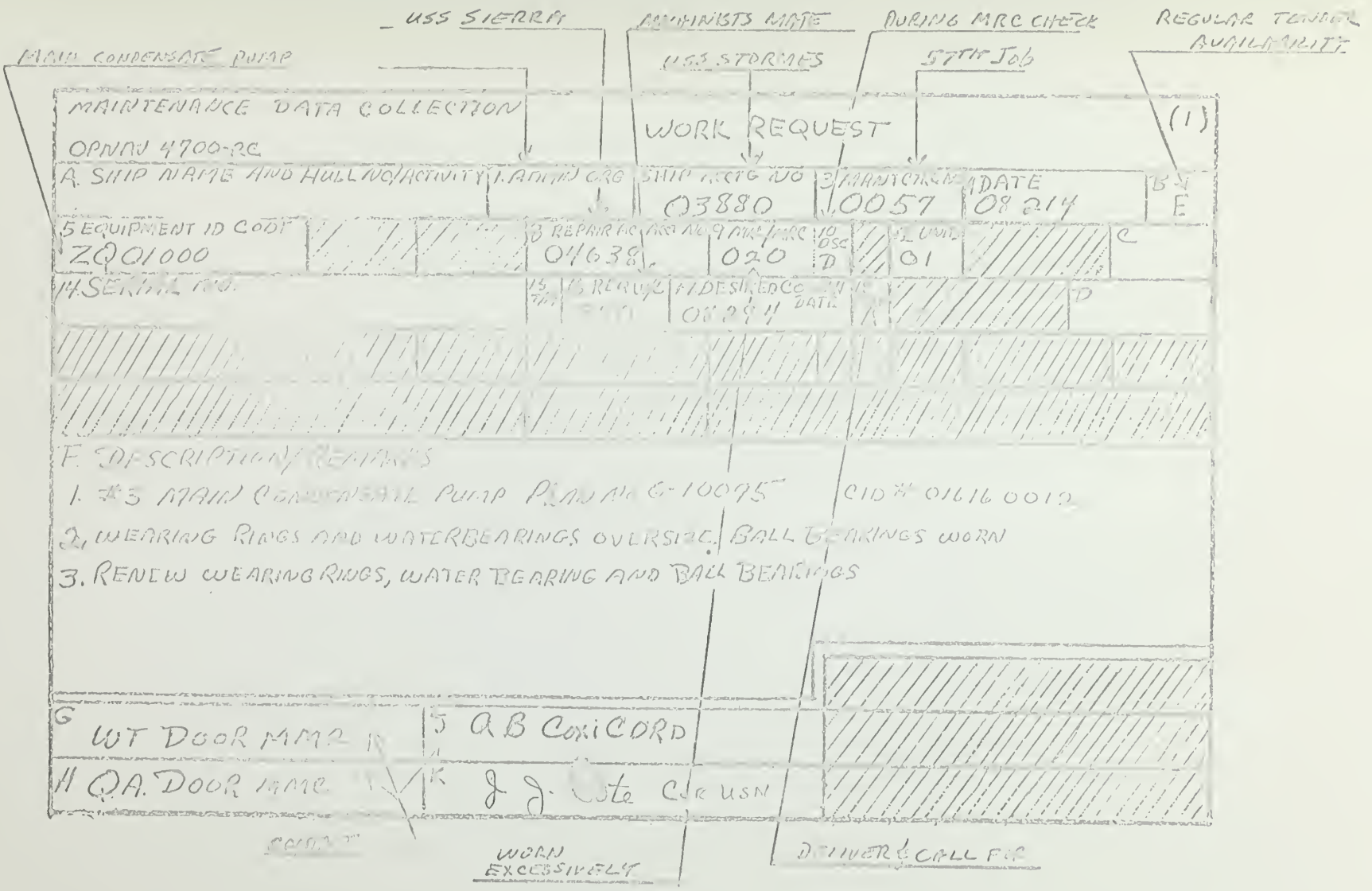

USS SIERRA
MACHINISTS MATE
DURING MRC CHECK
REGULAR TENDER AVAILABILITY
MAIN CONDENSATE PUMP
USS STORMES
57TH JOB
MAINTENANCE DATA COLLECTION
OPNAV 4700-2C
WORK REQUEST
(1)
A. SHIP NAME AND HULL NO/ACTIVITY
SHIP REG NO
03880
MAN/CREW
0057
DATE
08 214
5 EQUIPMENT ID CODE
ZQ01000
8 REPAIR ID
04638
9 MAT/FARC
020
10 OSC
D
11 QUAN
01
14 SERIAL NO.
16 DESIRED COMP DATE
08 284
F. DESCRIPTION/REMARKS
1. #3 MAIN CONDENSATE PUMP PLAN NO C-10095
CID # 01616 0012
2. WEARING RINGS AND WATERBEARINGS OVERSIZE. BALL BEARINGS WORN
3. RENEW WEARING RINGS, WATER BEARING AND BALL BEARINGS
G WT DOOR MMC
J A B CONICORD
H QA DOOR MMC
K J. J. Cote CDR USN
WORN EXCESSIVELY
DELIVER & CALL FOR

Figure 10

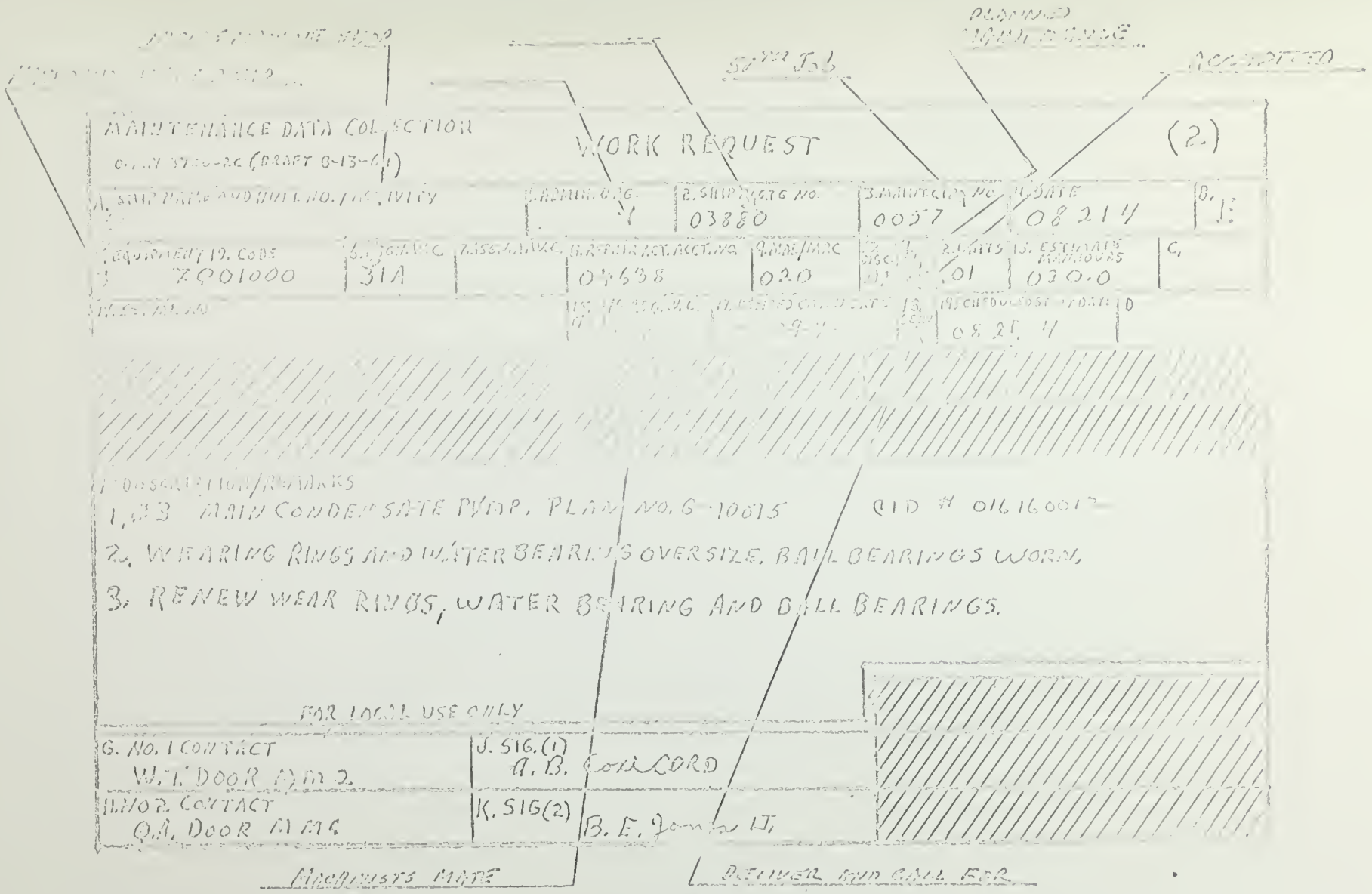

MAINTENANCE DATA COLLECTION
WORK REQUEST
(2)
2. SHIP'S ORG NO.
03880
3. MAINTENANCE NO.
0057
4. DATE
08214
EQUIPMENT ID. CODE
ZQ01000
31A
0+638
020
01
0300
08 21 4
1. DESCRIPTION/REMARKS
1,23 MAIN CONDENSATE PUMP, PLAN NO. 6-10015
2. WEARING RINGS AND WATER BEARINGS OVERSIZE, BALL BEARINGS WORN.
3. RENEW WEAR RINGS, WATER BEARING AND BALL BEARINGS.
FOR LOCAL USE ONLY
G. NO. 1 CONTACT
W.T. DOOR GANG
J. 516.(1)
A. B. CONCORD
H. NO. 2 CONTACT
Q.A. DOOR GANG
K. 516(2)
B. E. Jones III
MACHINISTS MATE
PETTY OFFICER

Figure 11

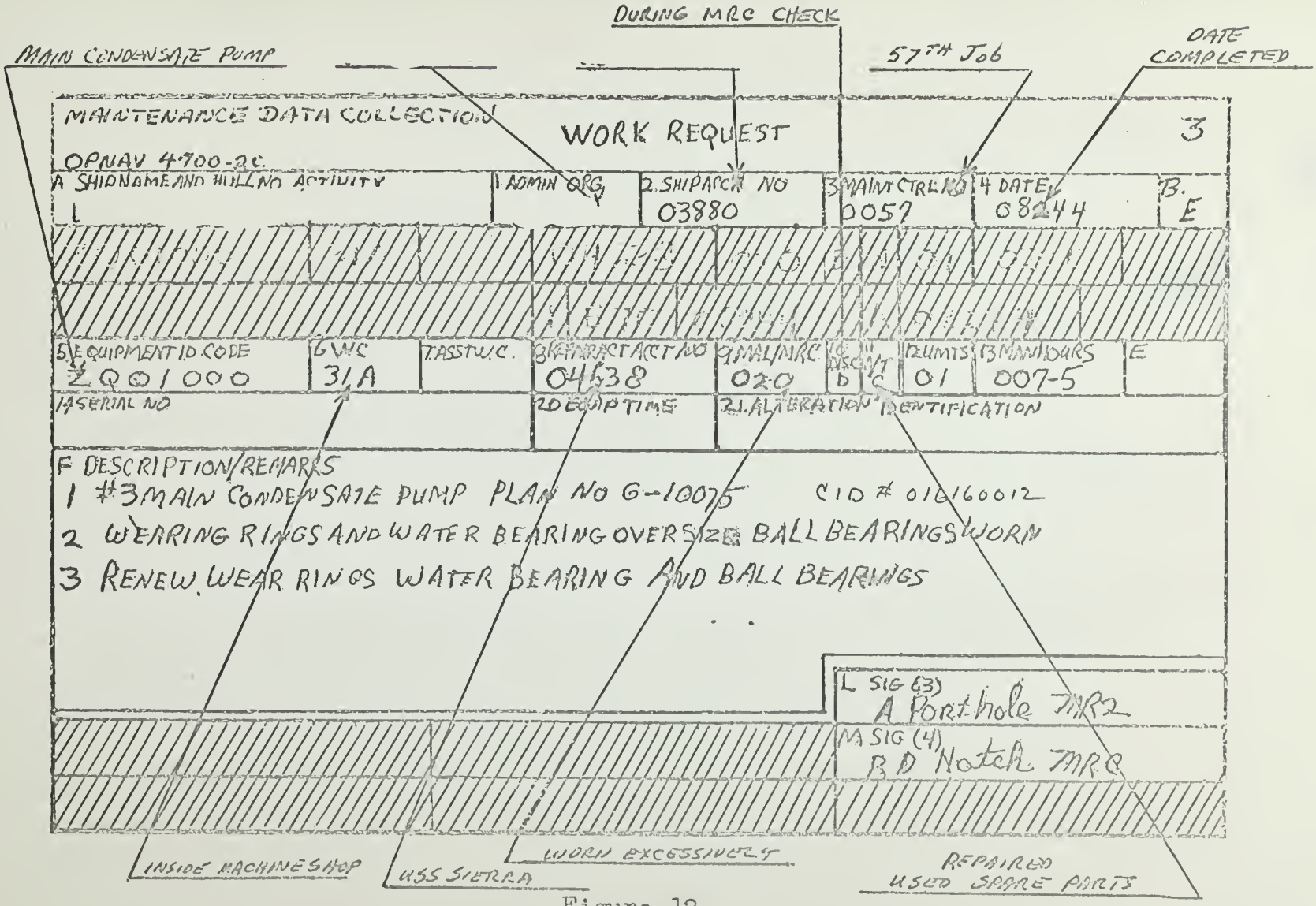

DURING MRC CHECK
MAIN CONDENSATE PUMP
57TH JOB
DATE COMPLETED
MAINTENANCE DATA COLLECTION
WORK REQUEST
3
OPNAV 4700-2C
A SHIPNAME AND HULL NO ACTIVITY
1 ADMIN ORG
2. SHIPACCT NO
3 MAINT CTRL NO
4 DATE
B.
1
03880
0057
08244
E
5 EQUIPMENT ID CODE
6 WUC
7 ASSY WUC
8 CONTRACT ACCT NO
9 MAL/MRC
10 DISC
11
12 UNITS
13 MAN HOURS
E
2Q01000
31A
04638
020
D
C
01
007-5
14 SERIAL NO
20 DOWN TIME
21 ALTERATION IDENTIFICATION
F DESCRIPTION/REMARKS
1 #3 MAIN CONDENSATE PUMP PLAN NO G-1007S
CIO # 016160012
2 WEARING RINGS AND WATER BEARING OVERSIZE BALL BEARINGS WORN
3 RENEW WEAR RINGS WATER BEARING AND BALL BEARINGS
L SIG (3)
A Porthole MR2
M SIG (4)
B D Notch MRC
INSIDE MACHINE SHOP
USS SIERRA
WORN EXCESSIVELY
REPAIRED USED SPARE PARTS

Figure 12

MAINTENANCE DATA COLLECTION
OPNAV 4700-2C (DRAFT 8-13-64)

WORK REQUEST (4)

A. SHIP NAME AND HULL NO / ACTIVITY	B. ADMIN. ORG.	C. SHIP ACCT. NO.	D. MAINT. CTRL. NO.	E. DATE	F.
		03880	0057	08 24 4	1

G. EQUIPMENT & COSE	H. RSN. W.C.	I. RSN. ELEM.	J. REPT. ACT. ACCT. NO.	K. MAL/MEL	L. DISC D	M. MT W	N. UNITS	O. ESTIMATED MAN HOURS	P.
ZQ 01000	31A		04538	020			01	020.0	

Q. SERIAL NO.	R. A/A	S. REQ. W.C.	T. DESIRED COMPLN DATE	U. SCHED	V. RESCHEDULED START DATE	W.
			08294		08244	

X. EQUIPMENT ID CODE	Y. W.C.	Z. ACCT. W.C.	AA. REPT. PROJECT NO.	BB. MAL/MEC	CC. DISC D	DD. MT C	EE. UNITS	FF. MAN HOURS	GG.
01000	31A		04538	020			01	007.5	

HH. SERIAL NO.	II. EQUIP. TYPE	JJ. ALTERATION IDENTIFICATION

K. DESCRIPTION/REMARKS

1. #3 MAIN CONDENSATE PUMP. PLAN NO. C-10075. CID # 016160012
2. WEARING RINGS AND WATER BEARING OVERSIZE. BALL BEARINGS WORN.
3. RENEW WEAR RINGS, WATER BEARING AND BALL BEARINGS.

L. SIG. (3)	
A. Pan[illegible] MR2	

G. NO. 1 CONTACT	J. SIG. (1)	M. SIG. (4)
W. T. DOOR MM2	R. B. [illegible] CDR	B. D. Walker MRC
H. MM2 CONTACT	**K. SIG. (2)**	**N. QUALITY CONTROL**
Q. A. DOOR MMC	B. E. [illegible]	W. T. Door MM2

Figure 13

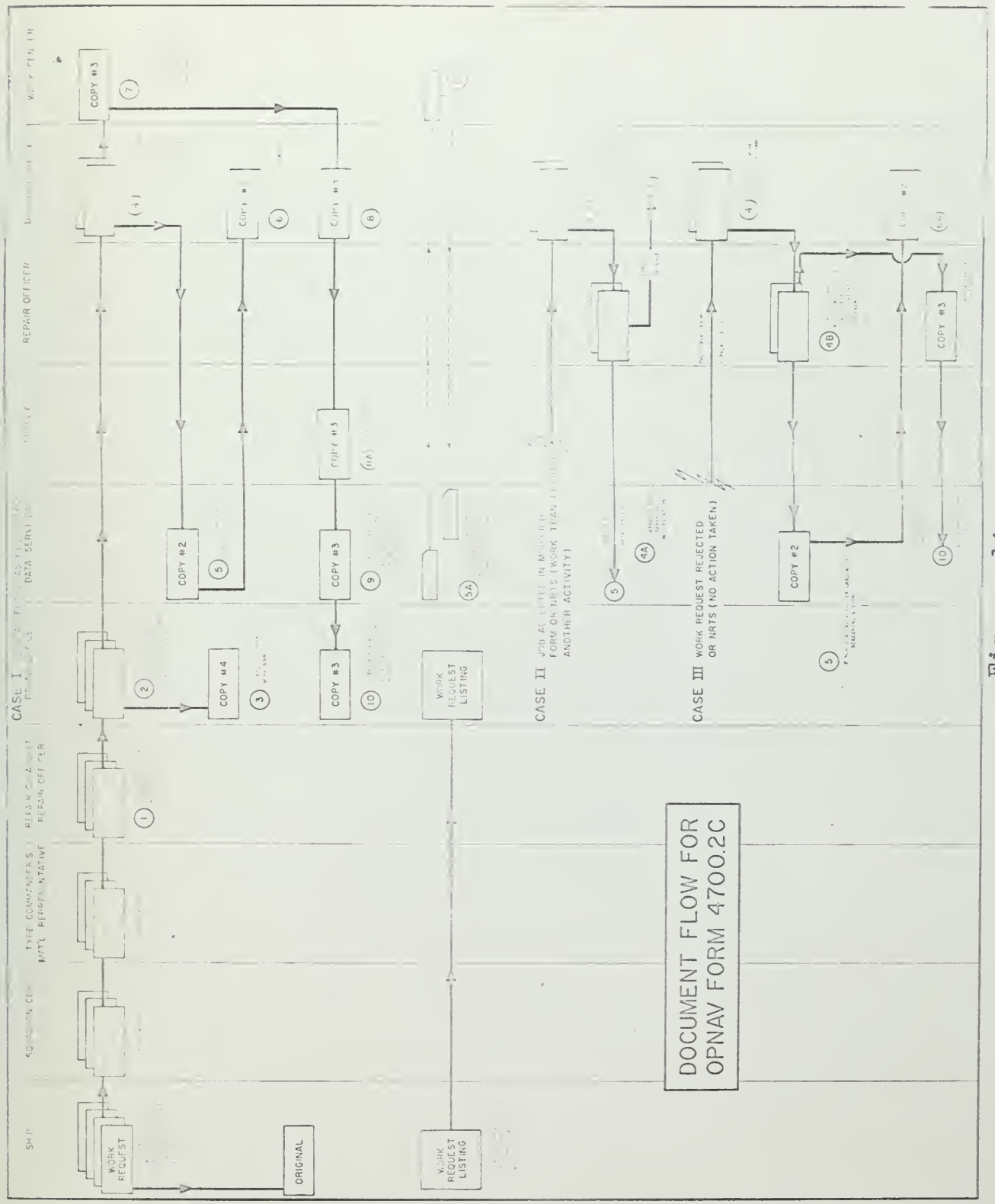

DOCUMENT FLOW FOR
OPNAV FORM 4700.2C
WORK REQUEST
ORIGINAL
COPY #2
COPY #3
COPY #4
WORK REQUEST LISTING
CASE I
CASE II
CASE III
WORK REQUEST REJECTED
OR NRTS (NO ACTION TAKEN)
REPAIR OFFICER

Figure 14

with the work to be performed by the repair activity. This should be one from each duty section. These individuals will be contacted by the repair activity for any additional information required to complete the job.

BLOCK K - Signature #1. This block is used by the commanding officer or his authorized representative to indicate command approval of the request for repair assistance.

Work Request form 4700.2C will be initiated by the ship requesting repair activity assistance. The disposition of copies is as follows:

The requesting activity will assign a maintenance control number and have the work request signed in Block "K" by the commanding officer or his authorized representative. Copy #1 will be retained on board by the requesting activity. Copies #2, 3 and 4 will be forwarded to the Type Commander Material Representative, if he is to review the work requests, or if not, directly to the repair activity. After review a code will be entered in Block 11 to indicate if the Work Request was approved or disapproved for completion by the repair activity.

CHAPTER V

READINESS REPORTING

The proper application of good management practice to produce efficiency in maintenance and materials consumed is of little use unless the top executive of an organization knows the status of the particular equipment or groups of equipment that are involved.

Today in the United States Navy there are over 36 reports that indicate the combat readiness of a ship, aircraft or divisions and groups of ships and aircraft.[1]

A single report to indicate the Combat Readiness of a unit is necessary because the requirements for readiness information imposed by commanders at every level, from the commanding officer of a ship to the Joint Chiefs of Staff, are steadily increasing. The need is for quantitative and up-to-date information, in terms that mean the same thing to everybody. Readiness is still not expressed in mutually understood terms and this is a requirement that must be settled before any uniform program for reporting to a single commander can be placed into operation.

In March 1965 a conference was scheduled to look into a Navy Operational Readiness Reporting System and one of the first items on the

---

[1]U. S. Navy Department, Fleet Readiness Analysis System Development Plan (Draft), Office of the Chief of Naval Operations, February 1965.

agenda was to settle on a definition of common terms.[2] In this agenda were such words as proficiency, performance, preparedness, endurance, readiness, elements of readiness, continuing readiness, readiness standards, operational readiness and mission area. The samples indicated above are used every day by Navy personnel, and almost every one of them can give a definition to these terms, but the question is how many will give the same definition. This is the problem to be solved first.

Single Readiness Information System

After the problem of definitions has been settled, then the approach to a Single Readiness Information System can be started. The purpose of a Single Readiness Information System will be to serve as a uniform insturment for communicating a Fleet Commander's opinion as to the readiness of the forces under his command.

The essential characteristics of an adequate and useful readiness information system are that it must:

A. Express the Elements of Readiness possessed and non-possessed by each operational unit with whatever degree of currency the commander may require.

B. Establish confidence as to the reliability of the readiness expressed.

C. Be feasible with respect to administration communications, equipment and personnel requirements.

---

[1] Ibid., p. 1.

D. Enable operational commanders to exert continuous control over the nature and degree of detail of information desired, reported and recorded.

E. Be useful to the units which originate the necessary reports.

F. Provide an output suitable and adaptable to all operational and analytical uses without modifying or adding to any source reports. Such uses would include:

(1) Employment of operational decisions in emergency situations or combat.

(2) Correlation of unit readiness with group, force or fleet readiness.

(3) Correlation of current stated readiness with the results of exercises, wargames or operations involving units under study.

(4) Ready translation into formats or categories required by the Joint Chiefs of Staff.

(5) Identification of areas that require additional training.

(6) Display to personnel of a unit, the up-to-date readiness status of their own and associated units.

A Readiness Information System must be adapted to meet the above listed requirements and to replace the present multiplicity of readiness reports by a single system that will report all the needed information and still remain simple.

In the concept of "Elements of Readiness" a proposed plan that is to be studied is as follows:

The mission areas of all units could be covered by seven pre-assigned operational capabilities codes which are:

1 - Strike Warfare.

2 - Anti-Air Warfare.

3 - Anti-Submarine Warfare.

4 - Surface Defense Warfare.

5 - Fleet Support Mission.

6 - Non Combat Mission.

7 - Mobility.

All units will not be required to report in all Mission Areas as it is obvious that some units will not have capabilities in all areas.

Each mission area will have a degree of readiness which will be in conformance with those prescribed by the Joint Chiefs of Staff. They are:

1 - Fully Ready.

2 - Ready -- readiness significantly impaired by minor deficiencies.

3 - Marginal Ready -- readiness seriously impaired by major deficiencies.

4 - Not Ready.

There are several categories of factors that will limit a unit's readiness. These could include, but are not limited to, personnel, training,

material, supplies and intelligence. Each of these factors have a bearing as to why a unit is not Fully Ready for all Mission Areas it is capable of accomplishing. Each should be reported as a basis for the Unit Commander on which to make an evaluation of the overall readiness of his forces.

Although consistency and uniformity are important, the essential value of the Elements of Readiness concept is that it provides the commander with a simple tool by which he may choose the degree of detail which he desires to record. A data processing system which keeps track of "Elements of Readiness" must therefore be designed to accommodate any changes the using commander may choose to implement. As an example, a commander may wish to keep track of those units which are not qualified in anti-air warfare, or those that are not qualified to handle shore bombardment. He must be able to choose whichever he pleases, and thereafter be assured that this information will be accurately recorded as long as he deems it necessary.

As soon as a definite list is established of operational abilities which a unit should possess, it then will become possible for a unit commander to express the units readiness in communicable terms and use these reports for many types of analyses. It will become possible to correlate the results of inter-type and fleet type exercises with the readiness of each participating unit. This will give the commander an up-to-date operational evaluation of the capabilities rather than a word description as transmitted by the commanding officer.

When the recording is accomplished in an Automatic Data Processing facility then the commander may rearrange, combine or communicate up-to-date readiness information to any number of consumers. He will be able to do this in any form he finds useful, with a minimum of effort and without duplicate reports by the originating units.

Readiness, regardless of its condition, will be of little use for overall planning unless reports get into the right hands in a timely fashion. Therefore reporting of Elements of Readiness must be uniform and accurate. An Element of Readiness lost by an operating unit by reason of any deficiency in material, personnel or training, will be reported to a fleet computer facility by an abbreviated message.[3] The message will report an individual's abilities in the negative or will indicate that he does not possess the capability to carry out a specified mission. Therefor the absence of a report will indicate Fully Qualified.

The abilities reported as "non-possessed" by a unit will be taken from lists of Elements of Readiness made up or approved by the type commanders much as now covered in the exercises prescribed by the type training instruction. The fleet or type commanders will also prescribe the criteria for non-possession of each element. For example, retention of an ability to "conduct effective gunfire against surface targets at short-range" might be specified to require a given minimum score in standard short-range gunnery exercise. The ability would be considered

---

[3]Forms for the abbreviated messages will be worked out at a later conference when all requirements for reports have been decided.

lost by a unit, and reported "non-possessed," if such exercises were failed, or if the unit commander considered that the criteria could no longer be met. This might result from transfer of key personnel, equipment being out of commission, or lack of opportunity to maintain an adequate state of training.

If readiness information is to be valid, it must stem from a source which has close and timely knowledge of the status of each element. Thus if a unit commander were separated from one of the ships in his unit, he might find it useful to have the commanding officer keep him informed of elements of readiness lost, or, more simply, to delegate temporary authority to the commanding officer to make the necessary change reports directly to the computer facility. The procedure must be simple enough to enable reporting from the level of the individual commanding officer without putting excessive administrative burdens on him.

In order to strengthen the objective of readiness information the present once-a-year operational readiness inspection will be replaced by a system of continuous operational readiness evaluation. Under this procedure the unit commander or his seniors in the chain of command will select several elements of readiness for testing on a single occasion. This selection for testing shall be within the areas the individual units state they are qualified. The test should be held on an unannounced basis and at irregular time intervals, that is, not in a set pattern of time for testing an individual ship, such as every third month, every other month or even once each year. The test should be given as often as deemed

necessary and the same tests repeated if required on each occasion. The elements to be tested that the units indicate they are eligible for will be selected at mathematical random. Each will be tested as to whether the required operational product is limited by any deficiency in condition of material, adequacy of personnel, or state of training.

The correlation of unit readiness with fleet exercise results can be assisted by machine recording the conclusions presented in fleet exercise reports. For example, a conclusion to the effect that "Airborne Early Warning Aircraft" were ineffective in detecting low flying aircraft between 50 and 100 miles from the force can be entered into an Automatic Data Process file and recalled at will by programming "key words" such as "Airborne Early Warning" or "Low Flyer." The recorded readiness of each participating unit with respect to its ability to detect low flyers, or to operate effectively with Airborne Early Warning aircraft, can be sorted in the same way. Conclusions may then be drawn as to whether the exercise result was the fault of inadequate equipment, or of inability to employ the equipment available, and of how these conclusions compare to those reached in other analyzed exercises, synthetic war games or operational studies.

To the extent that recorded readiness information can lead to a dangerous over-confidence in its reliability, the procedure may serve as an improved basis for recognition of progress and reward of achievement in high readiness maintenance. The progress of units of different types and classes may be equitably compared, and each unit may be kept continuously appraised of its own readiness and the progress of other units, with very little paperwork. Since Elements of Readiness can be written as

useful training goals, an improved basis can be established to integrate internal, type, and intertype training into a smooth progression of operational proficiency during each unit's training cycle.

The Single Readiness Information System is at present under study and development and indicates a bold step forward in standardizing terms and concepts of readiness. This can result in more accurate information as well as a common basis for comparing units as to their readiness. It also shows that a flexible system can be built to extract the necessary data acquired by the several Technical Bureaus, Senior Commanders and individual units themselves with a minimum of paperwork and no duplication of efforts or heavy administrative burdens.

The Single Readiness Information System plan will be developed by tasks as set forth below:[4]

Task	Title
1	Establishment of a Single Readiness Information System on a test basis.
2	Establishment of prototype Elements and Standards of Readiness for a Task Group.
3	Translation of readiness information and display system.
4	Unit readiness internal information and display system.
5	Evaluation of validity of readiness expressed.
6	Implementation of Single Readiness Information Systems throughout the operating forces.

---

[4] Ibid., p. IV-1.

Task	Title
7	Evaluation of expression of readiness.
8	Review of Casualty Reporting System.
9	Integrated Naval Force Status and Deployment System.
10	Improvement of compatibility of automated information systems.
11	Automated library of conclusion of significance to readiness.
12	Establishment of Chief of Naval Operations Fleet Readiness Analysis Center.
13	Employment of Fleet Readiness Analysis System Information for purposes of operational decision making and support of Navy programs.
14	Monitoring of Fleet Readiness Analysis System Development Plan.

The Fleet Readiness Analysis System mentioned in Tasks 12, 13 and 14 is a plan to make readiness information available for analysis of causes of changes in readiness and for establishing useful relationships between Fleet Readiness and Navy Programming.

One basic question emerges from a study of the Single Reporting System. How can a Single Reporting System be developed allowing each Type or Fleet Commander to develop his own criteria for information to be reported? It appears that a single readiness information system should be established by the Chief of Naval Operations to support the Fleet Readiness Analysis System and any additional information required by a fleet, type or unit commander will be obtained from data included in a single readiness report originated by an individual unit.

CHAPTER VI

PROGRAM PROGRESS

In the previous chapter the discussion was directed toward a Single Reporting System which will indicate on a uniform basis the operational readiness of each individual unit in the United States Navy. Since this proposed program is still under study and no decisions have been made regarding its implementation, a final analysis of its progress will have to be made. The recognition that such a program is required for the use of top managers in their overall planning and decision making will inevitably result in some type of finalized procedures for this purpose.

The Maintenance and Material Management Program was originated in August 1963.[1] Since its start many thousands of manhours have poured into this project.

The initial Work Study Group studies brought forth some interesting statistics. One report of a Destroyer Squadron revealed the following information on preventive maintenance actually conducted aboard the ships involved.[2]

---

[1]U. S. Department of the Navy, OPNAV Instruction 4700.16A, 1 August 1963.

[2]U. S. Department of the Navy, Work Study Group Report of Desron XX -- October 1963 to February 1964, March 1964.

Planned Maintenance System Manhours
Typical 692 Class Destroyer

	Required by MRC's	Reported by Desron	
	2500	360	Manhours per month per ship
or	125	18	Manhours per day per ship
or	30	4	Minutes per man per day.

This study revealed that the ships were averaging 15% of the standard planned maintenance as required by the Maintenance Requirement Card. This sample may only be a chance item, but indications from other ships on an informal basis indicate this has been the pattern of planned maintenance throughout the fleet. Figure 15 is an example of a report on one piece of electronic equipment made by the same Work Study Group.[3]

From this graph the indications are that the greater the percentage of planned maintenance the smaller total of hours are used in all maintenance. Originally the Planned Maintenance System was installed on ships in the engineering department only. Gradually the plan was expanded to include all departments of a ship or unit that is involved in the 3-M system. The entire installation schedule is to be completed by October 1966. To date the installation has adhered to schedule and the target date appears to be well within the goals set.

---

[3] Ibid.

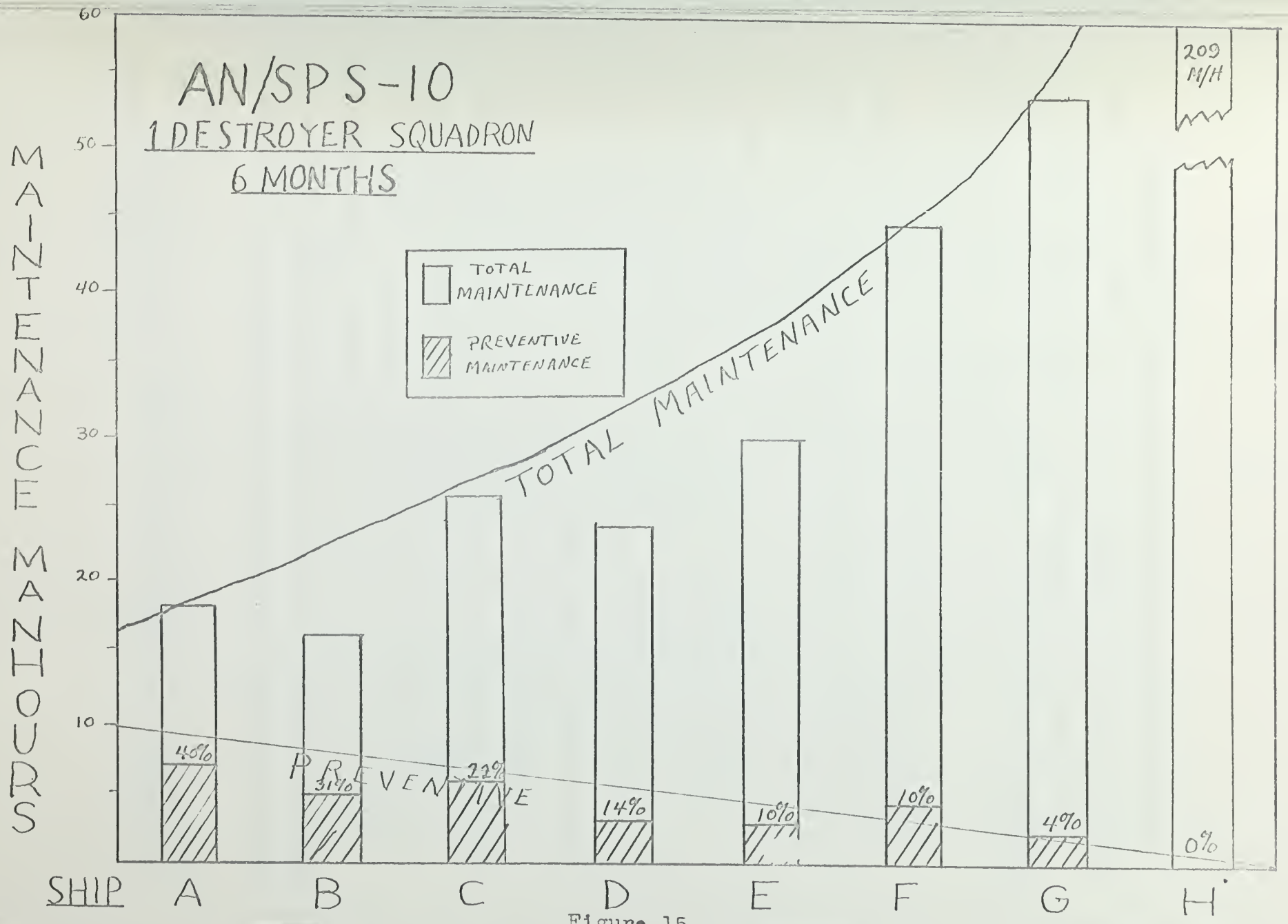

AN/SPS-10
1 DESTROYER SQUADRON
6 MONTHS
MAINTENANCE MANHOURS
60
50
40
30
20
10
TOTAL MAINTENANCE
PREVENTIVE
209 M/H
46%
31%
22%
14%
10%
10%
4%
0%
SHIP A B C D E F G H

Figure 15

The application of the maintenance portion was no great problem, as existing programs[4] were utilized and extended in the Navy Maintenance and Material Management program. The installation of the maintenance program in the Navy has been contracted to a private concern, the Stanwick Corporation, Arlington, Virginia.

The data collection for the Maintenance and Material Management program was entirely new as it does not extend any existing reporting systems. The Maintenance Data Collection System was entirely new so suffered the growing pains of any new program. After determination of the data required, written instructions on the requirements had to be distributed to the fleet. A way had to be found to adapt processing the new data into the Automatic Data Processing system in existence. To this end larger ships such as carriers and tenders were utilized to convert raw data into punch cards, as the smaller ships did not possess the necessary equipment. At present the cards are still being punched at a central activity, but in April 1965 a device will be tested to check the feasibility of locating a punching unit on board each unit involved in the 3-M program. This device is being tested by the Bureau of Supplies and Accounts and is about the size of an electric typewriter. It will also be used aboard the smaller ships for personnel accounting, requisition of materials, parts ordering and the maintenance data requirements of the program.

---

[4]Planned Maintenance System for ships and Maintenance Requirements Card for Aviation units.

Schools have been set up to teach shipboard personnel how to handle the necessary forms and charts and to indicate the benefits of the programs. As always, an educational program must be installed to show the participants that a change in the way of doing things can be of benefit. It must be shown that the old ways were not providing the necessary results required in a modern complex Navy.

The schedule of Maintenance Data Collection System installation is lagging a little behind the other parts of the program but is scheduled for complete installation by December 1966. The schedule is as follows:

Ship Type	Fleet	Date of Completion
Destroyers	Atlantic	June 1965
Destroyers	Pacific	June 1965
Mine Craft	Atlantic	September 1965
Mine Craft	Pacific	September 1965
Submarines	Atlantic	January 1966
Submarines	Pacific	January 1966
Carriers	Atlantic	March 1966
Carriers	Pacific	March 1966
Service Forces	Atlantic	September 1966
Service Forces	Pacific	September 1966
Amphibious Forces	Atlantic	December 1966
Amphibious Forces	Pacific	December 1966
Tenders	Atlantic	January 1966
Tenders	Pacific	January 1966

The complete installation could be delayed on the smaller ships as the test of the punch card equipment will determine how soon such equipment can be purchased and delivered. Until the installation of the punch card equipment is completed the small users will continue to have cards punched at a larger installation. Data cards will be sent to a Maintenance Data Computer Center at Mechanicsburg, Pennsylvania.

All data will be processed and final reports will be distributed from this central point.

In addition to the reports required by the Technical Bureaus, Type and Fleet Commanders, a ship will get a monthly feedback report. This report will include the following:

(a) Reported Maintenance

(b) Data Validity

(c) Performance

(d) Material History

(e) Error Analysis Listings

(f) Ratio of scheduled to unscheduled maintenance

1 -- Mean and Variation for

-- Departments

-- Ships

-- Squadron

It appears the monthly feedback report to the individual ships will be the most beneficial of the data gathered. From this report a ship can schedule training, maintenance and history of the equipment used. The reports to bureaus and senior commanders will indicate a relative picture of the entire force, whereas a ship will have individual data for its immediate benefit.

Questions

As this paper is concluded, the following questions emerge about certain aspects of the program:

1. How can the commanding officer of a ship be sure that all the maintenance performed is included on his report?
2. How can a ship get Fireman Jones to fill out a Maintenance Data Collection Card OPNAV 4700.2B, when he is covered with dirt from being in the bottom of a ship working on a Fuel Oil Pump seal? He must get the necessary forms and code information onto the card from two or three different sources. Would it be easier to forget the paperwork after the pump works again and go get cleaned up?
3. What is to be done in the areas where technical assistance personnel is required, when most ships do not come close to having their allowance now?
4. Has the Chief of Naval Operations set down a standard requirement on data from the type commanders? If not, what will happen when one of the Technical Bureaus wants to know how many N 2/10 S radios have failed in the last year?
5. Do the senior commanders really believe a Single Reporting System can be designed that will be able to supply the minute details from a ship that are required today?

The question of simple instructions and elimination of details as proposed in these programs is excellent in theory, but a parallel project should also be undertaken to see how much useless information is gathered as a convenience. This could well be the subject of a research paper at some time in the future after the programs discussed here have been established and had time to prove their functional worth.

The concept of this paper was a study of new programs that have been introduced to the Navy, or programs that are under consideration for future introduction. These tools for management have been designed to produce efficiency of maintenance, manpower utilization and to increase operational readiness. When tested, the 3-M program has demonstrated that properly planned maintenance will substantially reduce the overall total maintenance costs. The Single Readiness Reporting System is still a goal to be achieved, and its total impact will not be known until it has been introduced, placed in operation and its effects analyzed.

APPENDIX I

PROGRAM MILESTONE PLANS

(REVISED) 1 JULY 1963 NAME OPNAVINST 4700.16 A CODE

Plan for	DEVELOPMENT AND IMPLEMENTATION OF A STANDARD SYSTEM FOR MANAGEMENT OF PLANNED MAINTENANCE THROUGHOUT THE OPERATING FORCES.	1 August 1963
PROGRAM MILESTONE PLAN A.0		

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A.0					
SHIPS	FWSG's	SWG	1		Develop and evaluate preventive maintenance documentation for basic ship types (hull, mechanical, electronics, electrical, ordnance).	2-1-4 (90%)		
WEPS								
WEPS	FWSG's	SWG	2		Install preventive maintenance documentation for all aircraft models (MRC Card System).	2-1-4 (90%)		
SWG		CNO	3		Develop a standard shipboard maintenance planning, control and record keeping system.	6-1-4		
WEPS	SWG		4		Develop a standard aviation maintenance planning, control and record keeping system.	4-1-4		
CNO	FLTCDR's	SWG	5		Install the standard shipboard maintenance management system throughout the operating forces.	2-1-5 90%		
WEPS	FLTCDR's	SWG	6		Install the standard aviation maintenance management system throughout the operating forces.	1-1-5		
SWG	SHIPS WEPS	CNO	7		Develop a sytem for control of the standard maintenance management system.	4-1-4		
							1963	1964

(REVISED) 1 JULY 1963 NAME OPNAVINST 4700.16 A CODE

Plan for .....

PROGRAM MILESTONE PLAN A.0 (cont'd)

DEVELOPMENT AND IMPLEMENTATION OF A STANDARD SYSTEM FOR MANAGEMENT OF PLANNED MAINTENANCE THROUGHOUT THE OPERATING FORCES.

1 August 1963

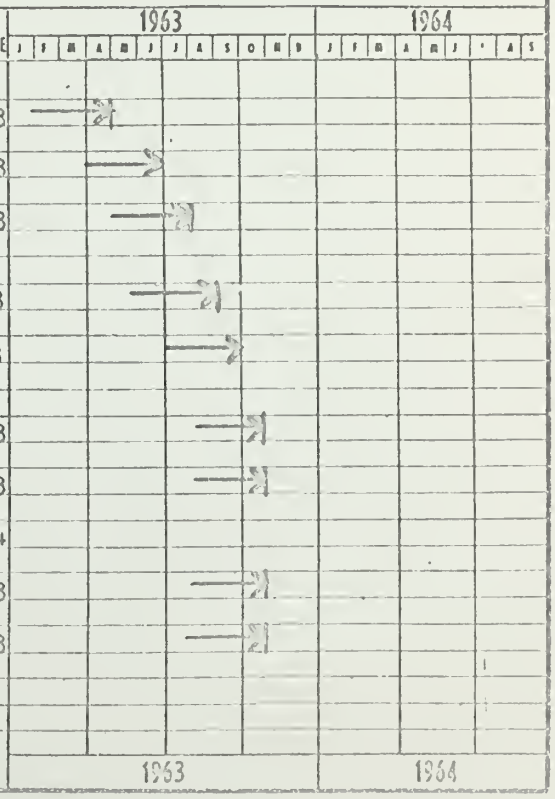
RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A.0					
SANDA	FWSG	SWG	8		Develop, test and evaluate uniform	4-1-4	→	
NAVCOMPT	FLTCDRs				material/supply support systems and			
	WEPS				procedures (Including related accounting			
	SHIPS				and budgetary support documentation and			
	NAVCOMPT				requirements) responsive to planned main-			
					tenance and material management needs			
					for ships and fleet aircraft squadrons.			
SANDA	FWSG	SWG	9		Install uniform material/support systems	1-1-6		→
NAVCOMPT	FLTCDRs				and procedures (including related ac-			
	WEPS				counting and budgetary support documenta-			
	SHIPS				tion and requirements) responsive to			
	NAVCOMPT				planned maintenance and material manage-			
	ONR				ment needs for ships and fleet aircraft			
					squadrons.			

1963 1964

(REVISED) 1 JULY 19% 3 NAME OPNAVINST 4700.16A CODE

Plan for		
A 1.0	DEVELOPMENT AND EVALUATION OF PREVENTIVE MAINTENANCE DOCUMENTATION FOR SHIPBOARD SYSTEMS (HULL, MECHANICAL, ELECTRICAL, ELECTRONICS, ORDNANCE)	1 August 1963

RESPONSIBILITIES			ACTION MILESTONES		COMPLETION DATE
Direct	Supporting	Monitoring	A 1.0		
SWG	SHIPS WEPS	CNO	1	Adopt standard format for preventive maintenance documentation.	5-1-3
WEPS SHIPS	FWSGs FLTCDR	SWG	2	Develop preventive maintenance documentation for DD 445/692/710 Class.	7-1-3
SHIPS	FLTCDR	SWG	3	Develop preventive maintenance documentation for DD 931/945/DL/DLG/DDG(Hull, mech., elect., electronics)	8-1-3
WEPS	"	"	4	Evaluate preventive maintenance documentation for DDG-2 Class (ordnance)	9-1-3
WEPS	"	"	5	Develop preventive maintenance documentation for DD 931/945/DL/DLG Class (ordnance)	10-1-3
WEPS SHIPS	"	"	6	Develop preventive maintenance documentation for SS(conv) types	11-1-3
SHIPS WEPS	"	"	7	Develop preventive maintenance documentation for DE types.	11-1-3
SHIPS WEPS	"	"	8	Develop preventive maintenance documentation for geared turbine auxiliaries.	1-1-4
SHIPS WEPS	"	"	9	Develop preventive maintenance documentation for amphibious types.	11-1-3
SHIPS WEPS	"	"	10	Develop preventive maintenance documentation for minecraft.	11-1-3



(REVISED) 1 JULY 196 3 NAME OPNAVINST 4700.16A CODE

Plan for .....

A 1.0
(continued)

DEVELOPMENT AND EVALUATION OF PREVENTIVE MAINTENANCE DOCUMENTATION FOR SHIPBOARD SYSTEMS (HULL, MECHANICAL, ELECTRICAL, ELECTRONICS, ORDNANCE)

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES		COMPLETION DATE
Direct	Supporting	Monitoring			
			A 1.0		
SHIPS	FLTCDR	SWG	11	Develop preventive maintenance documentation for aircraft carriers.	2-1-4
WEPS	"	"	12	Develop preventive maintenance documentation for missile systems.	- -
SHIPS	FLTCDR	SWG	13	Develop preventive maintenance documentation for CGN, SSN, CVAN, DLGN (hull, mech., elec.)	- -
WEPS	"	"	14	Develop preventive maintenance documentation for SSBN weapon.	- -

1963 1964

J F M A M J J A S O N D J F M A M J J A S

1963 1964

(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for A2.0

INSTALL PREVENTIVE MAINTENANCE DOCUMENTATION FOR ALL AIRCRAFT MODELS (MRC CARD SYSTEM)

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A2.0					
BUWEPS	WEPS (Field)	SWG	1		Finalize standard format for preventive maintenance documentation	6-1-63	→	
BUWEPS	NATTC MMMPC WEPS(Field)	SWG	2		Establish training programs as required for implementation of the preventive maintenance documentation system.	9-1-63	→	
BUWEPS	WEPS (Field)	SWG	3		Develop preventive maintenance documentation for all Fleet and Fleet Marine Force operational aircraft	2-1-64		
BUWEPS	WEPS (Field)	SWG	4		Develop preventive maintenance documentation for all training command models.	2-1-64	→	
BUWEPS	WEPS (Field)	SWG	5		Develop preventive maintenance documentation for reserve command aircraft.	2-1-64	→	
BUWEPS	WEPS (Field)	SWG	6		Develop preventive maintenance documentation for utility and support aircraft.	2-1-64	→	

1963 1964

(REVISED) 1 JULY 1963 NAME OPNAVINST 4700.16 A CODE

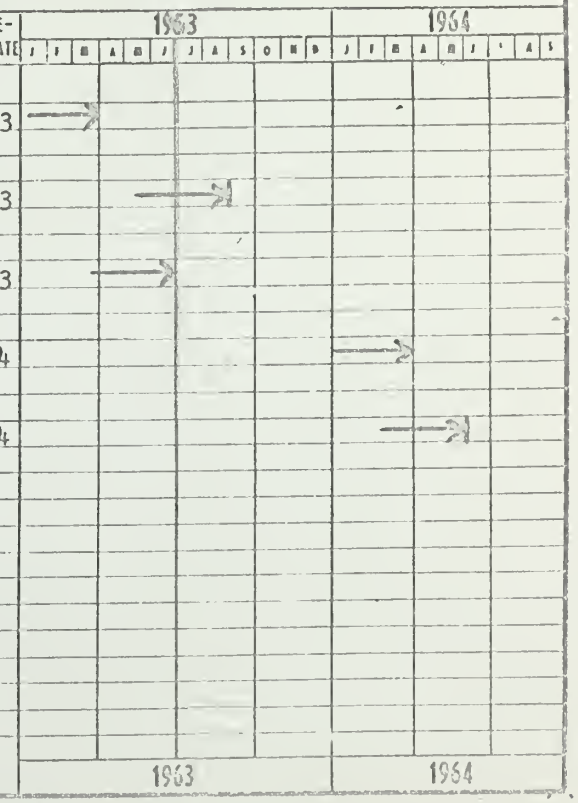
Plan for .....

A3.0

DEVELOP A STANDARD SHIPBOARD MAINTENANCE PLANNING, CONTROL AND RECORD KEEPING SYSTEM.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	A3.0			
FLTCDRs	FWSGs	WEPS	1		Evaluate LOWRY engineering department,	4-1-3
		SHIPS			maintenance planning and control system	
		SANDA			in LANT/PAC FLT DD's.	
FLTCDRs	FWSGs	WEPS	2		Evaluate LOWRY electronic/ordnance	9-1-3
		SHIPS			maintenance planning and control systems	
		SANDA			in LANT/PAC FLTs DD's.	
SWG	WEPS	CNO	3		Interim definition of standard shirboard	7-1-3
	SHIPS				maintenance planning and control system	
	SANDA				for operating forces.	
CNO	FWSG	SWG	4		Fleet Work Study project to determine	4-1-4
					maintenance/supply records for shipboard	
					administration.	
SWG	SHIPS	CNO	5		Complete preparation of standard ship-	6-1-4
					board maintenance management publication	
					and distribute.	



(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for A4.0

DEVELOP A STANDARD AVIATION MAINTENANCE PLANNING, CONTROL AND RECORD KEEPING SYSTEM.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	A 4.0			
BUWEPS	MMMPC	SWG	1		Determine the range and content to be included in the Naval Aircraft Maintenance Program Manual.	9-1-63
	FLTCDRs					
BUWEPS	MMMPC	SWG	2		Prepare new chapters to be included in the NAMP Manual.	11-1-63
BUWEPS	MMMPC	SWG	3		Revise present addition of NAMP Manual as required.	11-1-63
	FLTCDRs					
BUWEPS		SWG	4		Consolidate and review revised NAMP Manual.	2-1-64
BUWEPS		SWG	5		Submit for approval.	3-1-64
BUWEPS			6		Print and distribute revised NAMP Manual.	4-1-64

1 JULY 19 63 NAME OPNAVINST 4700.16A CODE

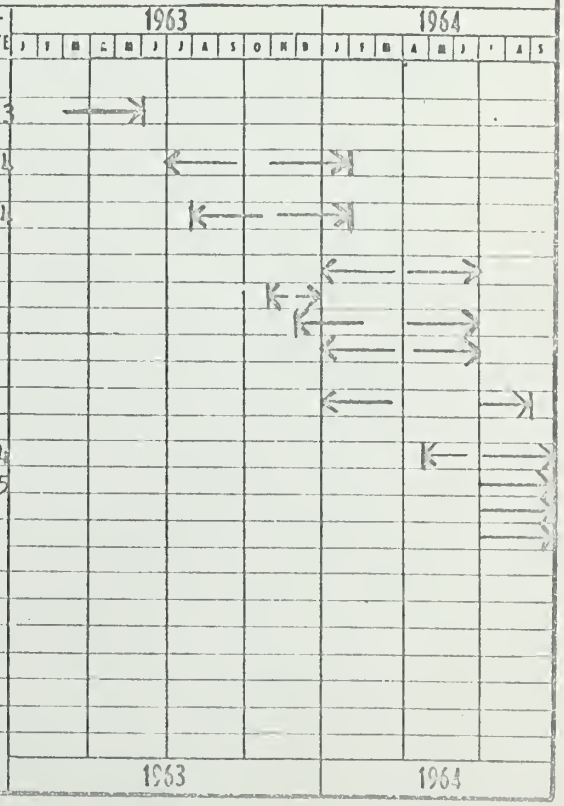
Plan for .....

A 5.0

INSTALL THE STANDARD SHIPBOARD MAINTENANCE MANAGEMENT SYSTEM THROUGHOUT THE OPERATING FORCES.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	A 5.0			
CNO	FMSGs	SWG	1	Establish Installation Team training courses at FSWG, LANT and PAC.		6-1-63
CNO	FLTCDRs	SWG	2	Install maintenance management system in DD 445/692/710 Class (204 ships)		2-1-64
"	"	"	3	DD 931/945/DL/ DLG/ (less DLG missile) (50 ships)		2-1-64
"	"	"	4	Conventional SS, AGSS (112 ships)		7-1-64
"	"	"	5	DE Types (46 ships)		1-1-64
"	"	"	6	Minecraft (83 ships)		7-1-64
"	"	"	7	AD/AE/AF/AGC/AK/AKA/APA/AKS/AO/AR/AV/ AVS/APD (136 ships)		7-1-64
"	"	"	8	CVA/CVS/CA/CLG/CAG/CC (less missiles) (39 ships)		9-1-64
"	"	"	9	LPD/LPH/LST/LSD (75 ships)		10-1-64
"	"	"	10	Misc. Craft. (76 ships)		2-1-65
"	"	"	11	Complete missile ships		
"	"	"	12	Complete CVAN, SSN, SSBN, CGN, DLGN		



(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for .....

A6.0

INSTALL THE STANDARD AVIATION MAINTENANCE MANAGEMENT SYSTEM THROUGHOUT THE OPERATING FORCES.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A6.0					
CNO	FLTCDRS BUWEPS	SWG	1		Establish command relationships.	9-1-63	→	
BUWEPS	FLTCDRS MMMPC BUSANDA	SWG	2		Establish Milestone Plan for activity implementation.	10-1-63	→	
BUWEPS	FLTCDRS BUPERS	SWG	3		Establish Personnel Reassignment Plan	2-1-63	→	
BUWEPS	FLTCDRS MMMPC BUSANDA	SWG	4		Establish funding, equipment and training requirements for each activity.	3-1-63	→	

1963 1964

(REVISED) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for		1 August 1963
A 7.0	DEVELOP A SYSTEM OF CONTROL OF THE STANDARD MAINTENANCE MANAGEMENT SYSTEM.	

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A 7.0					
SWG	WEPS	CNO	1		Develop a system for controlling changes in planned maintenance requirements and documentation.	9-1-3	→	
	SHIPS							
	SANDA							
SHIPS	WEPS	SWG	2		Revise specifications for procurement of the standard maintenance management system and documentation in new ship construction.	8-1-3	→	
ONM	WEPS	SWG	3		Develop standard specifications for procurement of maintainability data and maintenance documentation for new equipments/systems.			
	SHIPS							
	SAND/							
CNO	WEPS	SWG	4		Develop a system for fleet evaluation of planned maintenance requirements and documentation for new equipments/systems.			
	SHIPS							
	SANDA							
							1963	1964

(NEW) 1 JULY 19 3 NAME OPNAVINST 4700.16A CODE

Plan for .....

A 8.0

DEVELOP, TEST AND EVALUATE UNIFORM MATERIAL/SUPPLY SUPPORT SYSTEMS AND PROCEDURES (INCLUDING RELATED ACCOUNTING AND BUDGETARY SUPPORT DOCUMENTATION AND REQUIREMENTS) RESPONSIVE TO PLANNED MAINTENANCE AND MATERIAL MANAGEMENT NEEDS FOR SHIPS AND FLEET AIRCRAFT SQUADRONS.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	A 8.0			
FWSG	ONR	SWG	1		Study and determine maintenance/supply interface relationships.	9-1-3
SANDA						
FWSG	WEPS	SWG	2		Examine and flow chart existing supply/ accounting/budgetary support/etc. documentation and flow processes.	9-15-3
	SANDA					
	SHIPS					
	FLTCDRs					
FWSG	FLTCDRs	SWG	3		Develop a comprehensive data base and a concept of operation to control the accumulation, recording, reporting, utilization and feed-back of meaningful information concerning parts usage, parts replacement, parts failure, parts requirements, etc., to support the planned maintenance effort and/or justify forecasting, procurement and stocking policies.	11-15-3
SANDA	BUWEPS					
	SHIPS					
	ONR					
FWSG	FLTCDRs	SWG	4		Develop procedures for positioning, control, and/or reporting of repairable/ high cost items, bench stocks, pre-expended materials, material held awaiting parts and components scheduled through the repair cycle.	11-15-3
SANDA						

1963 1964

77

(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for ..... A 8.0 (continued)

DEVELOP, TEST AND EVALUATE UNIFORM MATERIAL/SUPPLY SUPPORT SYSTEMS AND PROCEDURES (INCLUDING RELATED ACCOUNTING AND BUDGETARY SUPPORT DOCUMENTATION AND REQUIREMENTS) RESPONSIVE TO PLANNED MAINTENANCE AND MATERIAL MANAGEMENT NEEDS FOR SHIPS AND FLEET AIRCRAFT SQUADRONS.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A 8.0					
FWSG	FLTCDRs	SWG	5		Examine technical library publications currently in use for parts/stock number identification, cross reference data, interchangeability information, etc., and recommend minimum technical publications necessary to insure responsive material support to the maintenance effort.	11-15-3	→	
SANDA	FMSO							
	SHIPS							
	WEPS							
FWSG	FLTCDRs	SWG	6		Develop integrated maintenance and material supply source documents where practical to facilitate the recording, collection and processing of information common to both the maintenance and material management program.	12-15-3	→	
FWSG	FLTCDRs	SWG	7		Define requirements for and develop recommended shipboard (surface and aviation) supply, accounting and budgetary support systems and procedures responsive to planned shipboard maintenance program and fleet management needs.	1-1-4	→	
SANDA	SHIPS							
NAVCOMPT	WEPS							
	NAVCOMPT							
SANDA	FLTCDRs	SWG	8		Test, analyze and evaluate the proposed supply and related accounting systems and procedures on board USS SIERRA (AD-18), several DD's and USS FORRESTAL (CVA-59).	4-1-4	→	
NAVCOMPT	NAVCOMPT							

1963 1964

(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for ..... A 8.0 (continued)

DEVELOP, TEST AND EVALUATE UNIFORM MATERIAL/SUPPLY SUPPORT SYSTEMS AND PROCEDURES (INCLUDING RELATED ACCOUNTING AND BUDGETARY SUPPORT DOCUMENTATION AND REQUIREMENTS)RESPONSIVE TO PLANNED MAINTENANCE AND MATERIAL MANAGEMENT NEEDS FOR SHIPS AND FLEET AIRCRAFT SQUADRONS.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	A 8.0					
SANDA	FWSG		9		Revise BUSANDA Manual to reflect new	6-1-4		——
	NAVCOMPT				supply procedures.			

1963 1964

(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16 A CODE

Plan for .....

A 9.0

INSTALL UNIFORM MATERIAL/SUPPLY SYSTEM AND PROCEDURES (INCLUDING RELATED ACCOUNTING AND BUDGETARY SUPPORT DOCUMENTATION AND REQUIREMENTS) RESPONSIVE TO PLANNED MAINTENANCE AND MATERIAL MANAGEMENT NEEDS FOR SHIPS AND FLEET AIRCRAFT SQUADRONS.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	A 9.0			
CNO	SANDA	SWG	1		Establish supply systems and procedures installation team training courses at FMSG, LANT and PAC.	4-1-[illegible]
FMSG	NAVCOMPT FLTCDRs BUPERS SANDA	SWG	2		Train and indoctrinate Fleet personnel in the application of shipboard (surface and aviation) supply support, and related accounting and budgetary support systems and procedures.	7-1-[illegible]
SANDA NAVCOMPT	FMSG NAVCOMPT	SWG	3		Install supply, and related accounting and budgetary support, systems and procedures.	1-1-6[illegible]

1963 1964

J F M A M J J A S O N D J F M A M J J A S

1963 1964

1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for B.0

PROGRAM MILESTONE PLAN

DEVELOPMENT AND IMPLEMENTATION OF A UNIFORM MAINTENANCE DATA COLLECTION SYSTEM IN SUPPORT OF THE NAVY MAINTENANCE AND MATERIAL MANAGEMENT PROGRAM FOR SHIPS AND SQUADRONS OF THE OPERATING FORCES.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	B.0			
SWG	FLTCDRs	CNO	1		Determine Navy Maintenance Data	1-1-4
	BUREAUS				Collection System Requirements.	
"	"	"	2		Evaluate U. S. Air Force Maintenance	1-1-4
					Data Collection System (AFM 66-1) Air	
"	"	"	3		Evaluate U. S. Air Force Maintenance	1-1-4
					Data Collection System (AFM 66-1)	
					Surface Forces.	
"	"	"	4		Define Navy Maintenance Data Collection	4-1-4
					(MDC) System.	
"	"	"	5		Define Navy Automatic Data Processing	4-1-4
					System (ADP).	
CNO	"	SWG	6		Implement Navy Maintenance Data Collec	1-1-5
					tion and Automatic Data Processing	
					System Navy-wide.	1-1-6

1963 1964

J F M A M J J A S O N D J F M A M J J A S

AIR

SURFACE FORCES

1963 1964

(REVISED) 1 JULY 1963 NAME . OPNAVINST 4700.16 A CODE

Plan for .....

B1.0

PLAN FOR DETERMINING NAVY MAINTENANCE DATA COLLECTION SYSTEM REQUIREMENTS.

2 August 1963

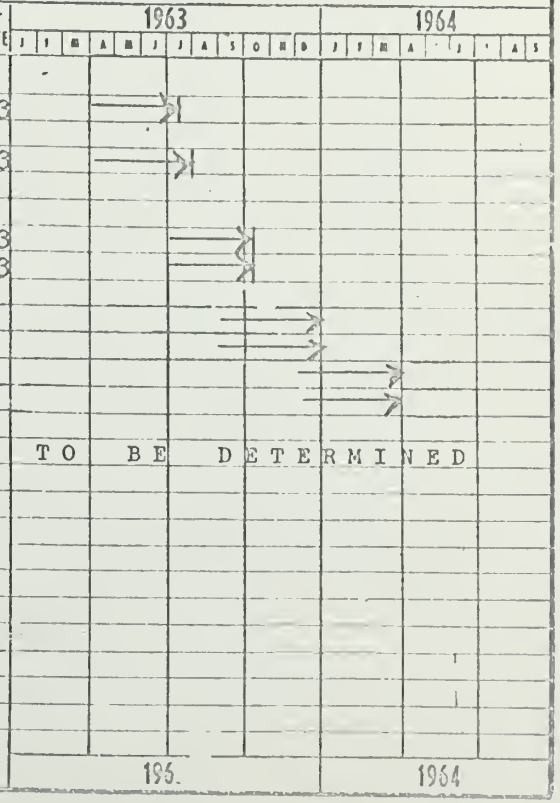
RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J A S
Direct	Supporting	Monitoring	B1.0					
CNO	SWG		1		Establish Maintenance and Material Management Project Center	4-1-3	→	
SWG	TechBur	CNO	2		Initiate Study of Existing Data Collection Systems	4-1-3	→	
SWG	MMMPC	CNO	3		Initial Definition of System Requirement	7-1-3	→	
SWG	MMMPC	CNO	4		Initial Definition of Management Responsibility	7-1-3	→	
SWG	MMMPC	CNO	5		Initial Definition of Management Functions	7-1-3	→	
SWG	MMMPC	CNO	6		Initial Definition of Management Information required at each management level	7-1-3	→	
SWG	MMMPC	CNO	7		Initiate formal review of 66-1 Evaluation	10-1-3	→	
SWG	MMMPC	CNO	8		Complete formal review of 66-1 Evaluation	4-1-4	→	
CNO	SWG		9		Final Definition of System Requirements	4-1-4	→	
					(SEE Task B4.0 for details)			

1963 1964

(REVISED) 1 JULY 196 3 NAME OPNAVINST 4700.16 A CODE

Plan for		
B2.0	PLAN FOR DEVELOPMENT AND TRIAL EVALUATION OF U. S. AIR FORCE MAINTENANCE DATA COLLECTION AND EXCEPTION TIME ACCOUNTING SYSTEM FOR NAVAL AVIATION.	1 August 1963

RESPONSIBILITIES				ACTION MILESTONES B2.0	COMPLETION DATE
Direct	Supporting	Monitoring			
SANDA	SHIPS	SWG	1	Determine automation required and install in CVA-59.	7-15-3
	ASO				
SANDA	ASO		2	Install mechanized supply procedures at Oceana on Research and Test basis to provide maximun support to AFM 66-1.	8-1-3
	WEPS				
MMMPC	FLTCDR	SWG	3	Train Oceana RCVG-4 & VU Sqd Analysts	10-15-3
MMMPC	SWG	FLTCDR	4	Train Oceana RCVG-4 & VU Sqd and implement AFM 66-1 system.	10-15-3
MMMPC	SWG	CAG-6	5	Train CVG-6 Maintenance Analysts	1-1-4
MMMPC	SWG	CAG-6	6	Train CVG-6 & implement AFM 66-1 system.	1-1-4
MMMPC	SWG	CAG-7	7	Train CVG-7 Maintenance Analysts	4-1-4
MMMPC	SWG	CAG-7	8	Train CVG-7 & implement AFM 66-1 system.	4-1-4
MMMPC	SWG		9	Train VA 42 and implement AFM 66-1 System.	TO BE DETERMINED



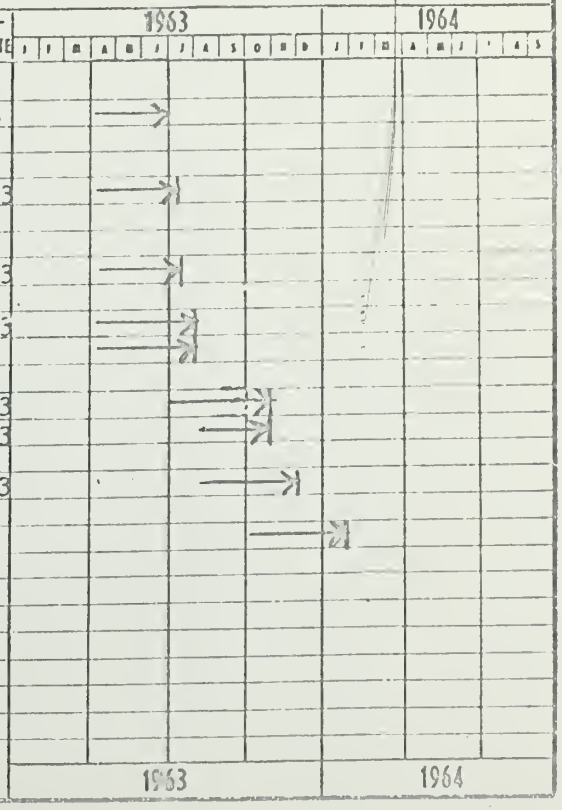
(REVISED) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for .....
B3.0

PLAN FOR DEVELOPMENT AND TRIAL EVALUATION OF U. S. AIR FORCE MAINTENANCE DATA COLLECTION AND EXCEPTION TIME ACCOUNTING SYSTEMS (AFM 66-1) FOR SURFACE FORCES.

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	B3.0			
MMMPC	SHIPS	SWG	1		Prepare Maintenance Collection Manual	7-1-3
	WEPS					
	SANDA					
MMMPC	SANDA	SWG	2		Develop EAM procedures for test	7-15-3
	WEPS					
	SHIPS					
SHIPS	SANDA	CNO	3		Install EAM in SIERRA	7-15-3
	FLTCDR					
MMMPC	FLTCDR	SWG	4		Train DD and AD Data Collection Personnel	8-1-3
FLTCDR	SWG	CNO	5		Implement Data Collection trial for Surface ships (Atlantic)	8-1-3
SHIP	SANDA	CNO	6		Install EAM in PIEDMONT	11-1-3
FWSG	FLTCDR	SWG	7		Train DD and AD Data Collection Personnel (Pacific)	11-1-3
FLTCDR	SWG	CNO	8		Implement Data Collection trial for surface ships (Pacific)	12-1-3
MMMPC	SWG	CNO	9		Finalize Data Collection Processing and Analysis Procedures	2-1-4



(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for .....

B 4.0

DEFINE NAVY MAINTENANCE COLLECTION(MDC) SYSTEM

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Supporting	Monitoring	B 4.0			
SWG	BUREAUS ONR	SWG	1		Establish study to determine operating forces and bureau management responsibilities and functions.	7-1-3
ONR	BUREAUS CNO FLTCDRs	SWG	2		Initiate task to survey user requirements for Maintenance Management Information.	8-1-3
ONR	BUREAUS ONR FLTCDRs	SWG	3		Complete study of operating force and Bureau management functions and responsibilities.	11-1-3
SWG	BUREAUS ONR	CNO SWG	4		Complete review of system to satisfy management requirements.	1-1-4
FLTCDRs	TYCOMS	SWG	5		Fleet Commander report on service test of AFM 66-1.	1-1-4
SWG	-	-	6		Complete definition of Navy Maintenance Data Collection System.	2-1-4
CNO	BUREAUS FWSG	SWG -	7		Publish Navy Maintenance & Material Management System Manual.	4-1-4

1963 1964

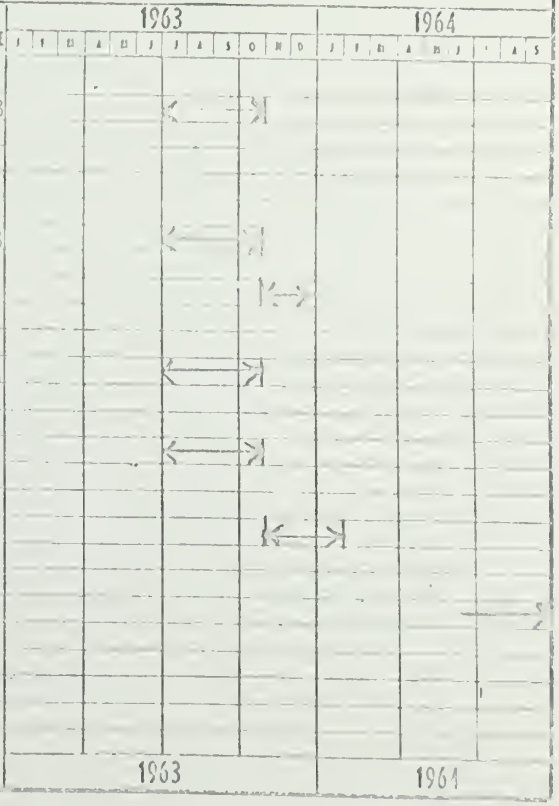
J F M A M J J A S O N D J F M A M J J A S

1963 1964

(NEW) 1 JULY1963 NAME OPNAVINST 4700.16 A CODE

Plan for		
B 5.0	DEFINE NAVY AUTOMATIC DATA PROCESSING SYSTEM (ADP)	1 August 1963

RESPONSIBILITIES				ACTION MILESTONES	COMPLETION DATE
Direct	Supporting	Monitoring			
			B 5		
BUSANDA	BUSHIPS	SWG	1	Conduct study of Shipboard ADP requirements to satisfy Fleet needs for maintenance, supply, accounting and budgetary management information.	11-1-3
	FLTCDRs				
	BUWEPS				
	FWSG				
	ONR				
BUSANDA	ONR	SWG	2	Develop specifications for ADP equipment to support shipboard requirements.	11-1-3
	BUREAUS				
BUSANDA BUSHIPS		SWG	3	Solicit ADP equipment bids and award contracts for support of Fleet-wide ADP requirements.	1-1-4
BUWEPS	BUSANDA	SWG	4	Conduct study of management information requirements associated with maintenance management effort at air stations.	11-1-3
	ONR				
BUWEPS	BUSANDA	SWG	5	Develop specifications for data processing equipment to support aviation maintenance requirements at air stations.	11-1-3
	ONR				
BUWEPS	BUSANDA	SWG	6	Solicit ADP equipment bids and award contract for aviation maintenance requirements ashore.	2-1-4
BUSANDA	BUWEPS	SWG	7	Develop a base level supply system for Navy-wide implementation to support the Aeronautical Maintenance Management Program.	2-1-5



(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

Plan for .....

B 5.0
(continued)

DEFINE NAVY AUTOMATIC DATA PROCESSING SYSTEM (ADP)

1 August 1963

RESPONSIBILITIES			ACTION MILESTONES			COMPLETION DATE
Direct	Support	Reporting	B 5			
BUWEPS	BUSANDA	CNO	8		Solicit ADP equipment bids and award contract for support of aeronautical base level supply system.	4-1-64
CNO	BUSANDA		9		Integrate and establish Navy-wide maintenance and material data feed-back requirements.	7-1-64
	BUSHIPS					
	BUWEPS					
	ONR					
CNO	BUSANDA		10		Develop specifications for ADP equipment to support Navy-wide requirements.	7-1-64
	BUSHIPS					
	BUWEPS					
	ONR					
CNO	BUSANDA		11		Solicit ADP equipment bids and award contract for central data processing facility.	10-1-64
	BUSHIPS					
	BUWEPS					
	ONR					

1963 1964

J F M A M J J A S O N D J F M A M J J A S

1963 1964

(NEW) 1 JULY 1963 NAME OPNAVINST 4700.16A CODE

File for		
B 6.0	IMPLEMENT NAVY MAINTENANCE DATA COLLECTION AND AUTOMATIC DATA PROCESSING SYSTEM NAVY-WIDE	1 August 1963

[illegible]	[illegible]	[illegible]	ACTION MILESTONES	COMPLETION DATE	1963 J F M A M J J A S O N D	1964 J F M A M J J
Direct	[illegible]	[illegible]	B 6.0			
			TO BE PROMULGATED LATER			
					1963	1964

GLOSSARY OF ABBREVIATIONS

ASO	Aviation Supply Office
Bureaus	All bureaus of the Navy Department
CAG	Carrier Air Group
CNO	Chief of Naval Operations
EDPM	Electronic Data Processing Machine or Electric Accounting Machine as appropriate
FLTCOM	Commander in Chief, Atlantic or Pacific or designated subordinates
FWSG	Fleet Work Study Group Atlantic and Pacific
MAG	Marine Air Group
MMMPC	Maintenance and Material Management Project Center (Under OIC FWSG Atlantic)
NAS	Naval Air Station
NATSF	Naval Aviation Technical Services Facility
PERS	Bureau of Personnel
SANDA	Bureau of Supplies and Accounts
SHIPS	Bureau of Ships
SWG	Staff Working Group
TECH. BUREAUS	BUWEPS, BUSHIPS
WEPS	Bureau of Naval Weapons
MDC	Maintenance Data Collection - a system of reporting scheduled and unscheduled maintenance actions performed on equipment.
ETA	Exception Time Accounting - a system of accounting for manpower utilization in the accomplishment of maintenance by means of an exception reporting system.

APPENDIX II

SAMPLE FORMS

SYSTEM	COMPONENT	M. R. NUMBER
		CARD OF
SUB-SYSTEM	RELATED M.R.	RATES M/H
MAINTENANCE REQUIREMENT DESCRIPTION		TOTAL M/H ELAPSED TIME

C-30470

MAINTENANCE REQUIREMENTS CARD
OPNAV FORM 4700-1 (REV. 1-64)

APPENDIX

EQUIP. PAGE	TYPE / CLASS / MAINTENANCE GROUP / COMPONENT	SCHEDULE AS INDICATED — QUARTER AFTER OVERHAUL: 1 5 9	2 6 10	3 7 11	4 8 12	EACH QUARTER

GROUP_____ WORK SCHEDULE FOR WEEK OF_____

COMPONENT	MAINTENANCE RESPONSIBILITY	PAGE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN	OUTSTANDING REPAIRS AND P.M. CHECKS DUE IN NEXT 4 WEEKS

MAINTENANCE GROUP	YEAR	QUARTER AFTER OVERHAUL
MONTH	MONTH	MONTH

EMPLOYMENT SCHEDULE

SAMPLE

ACTUAL SIZE 10 X 14

QUARTERLY MAINTENANCE SCHEDULE OPNAV FORM 4700-5 (4-64)

APPENDIX

SYSTEM, SUB-SYSTEM OR COMPONENT	REFERENCE PUBLICATIONS

BUREAU CARD CONTROL NUMBER	MAINTENANCE REQUIREMENT	M. R. NO.	RATE REQUIRED	MAN-HOURS	RELATED MAINTENANCE

MAINTENANCE INDEX PAGE
OPNAV FORM 4700-3 (4-64)

BUREAU PAGE CONTROL NUMBER

C-40995

APPENDIX

BIBLIOGRAPHY

Public Documents

U. S. Department of the Navy. Equipment Distribution and Condition (EDAC) Statistical Reporting System. Office of the Chief of Naval Operations, OPNAV 4700.19, 15 July 1964.

_____. Fleet Readiness Analysis System Development Plan, Office of the Chief of Naval Operations, Ser 18P03T, 3 February 1964.

_____. Maintenance and Material Management, Volume 1: Shipboard Maintenance, October 1964.

_____. Navy Maintenance and Material Management Manual (Tentative), Office of the Chief of Naval Operations, 6 October 1964.

_____. Naval Operational Readiness Reporting Systems Conference, Preliminary Scope of Agenda, Office of Chief of Naval Operations.

_____. Planned Maintenance System for Conventional BUWEPS Weapons System Equipment, Bureau of Naval Weapons, Proposed WS-4799, 18 January 1964.

_____. Procedure for the Description and Communication of Readiness. Report of Initial Trial Oct. 1963 - July 1964, Office of the Chief of Naval Operations, August 1964.

_____. Procedure for the Description and Communication of Readiness. Sample Directive for Implementation by a Unit or Ship. Office of the Chief of Naval Operations.

_____. Procedures for Implementation of the Planned Maintenance System in Ships. Office of the Chief of Naval Operations, OPNAV Instruction 4700.18A, 23 July 1964.

_____. Ships Readiness Improvement Plan: Interim Progress Report. Commander Cruiser-Destroyer Force, U. S. Pacific Fleet, COMCRUDESPAC Instruction 1500.5, 26 July 1962.

_____. Standard Navy Maintenance and Material Management System (3-M System); Policy for. Office of the Secretary of the Navy, SecNav Instruction 5430.69, 21 October 1964.

BIBLIOGRAPHY (continued)

_____. Standard Navy Maintenance Management System. Office of the Chief of Naval Operations, OPNAV Instruction, 1 August 1963.

_____. Standardization of Maintenance Requirement Cards for Shipboard Use. Office of the Chief of Naval Operations, OPNAV Instruction 4700.17A, 23 July 1964.

_____. The Planned Maintenance System Manual for U. S. Navy Ships. Office of the Chief of Naval Operations, OPNAV P43-1, July 1964.

Other Sources

U. S. Department of the Navy. Personal interview with Captain D. S. Appleton, Office of the Chief of Naval Operations, 24 February 1965.

_____. Personal interviews with Commander R. G. Hutzel. Office of the Chief of Naval Operations, November 1964 and March 1965.

thesD174
Management for maintenance, material and
3 2768 002 09622 4
DUDLEY KNOX LIBRARY